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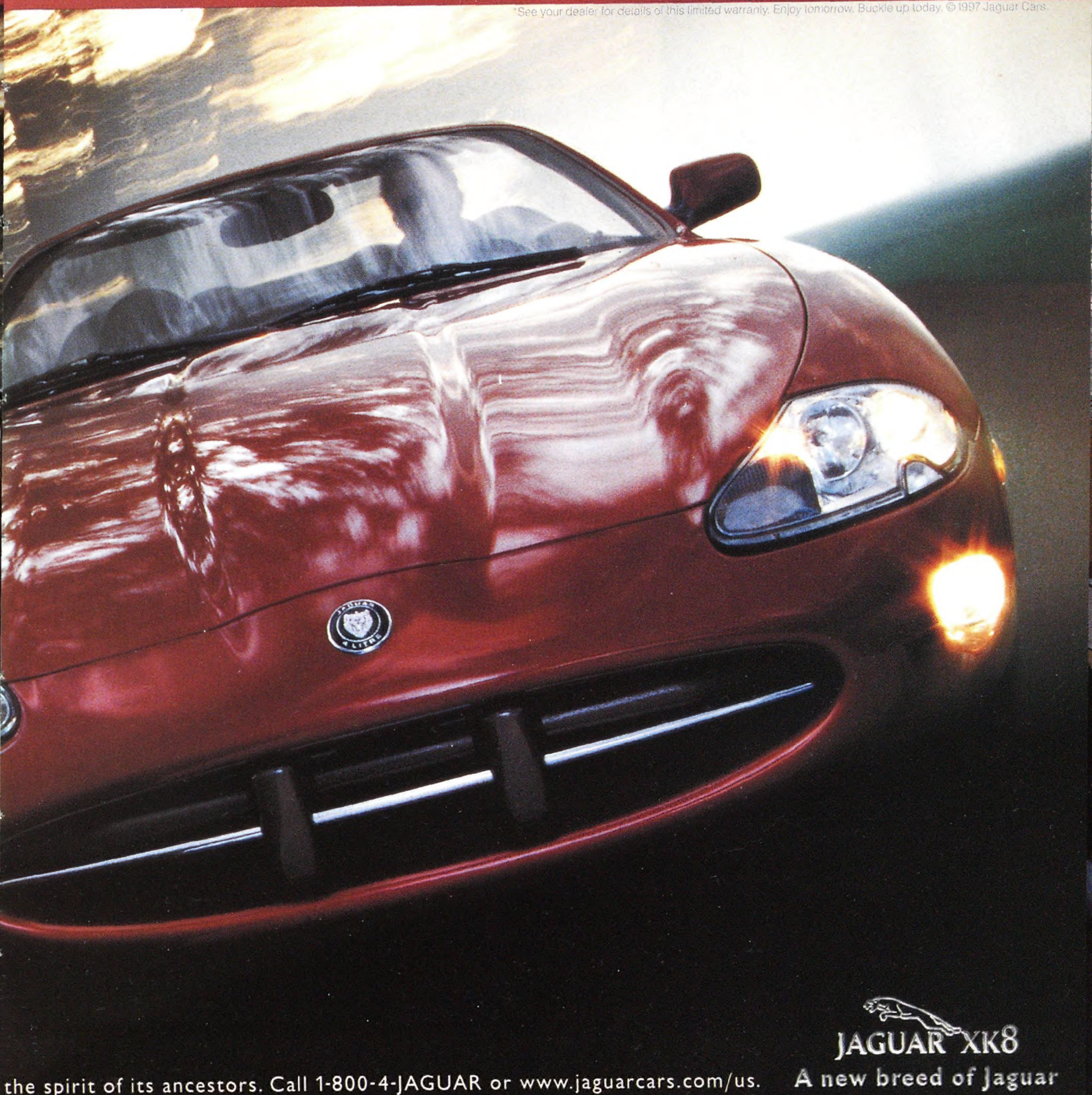


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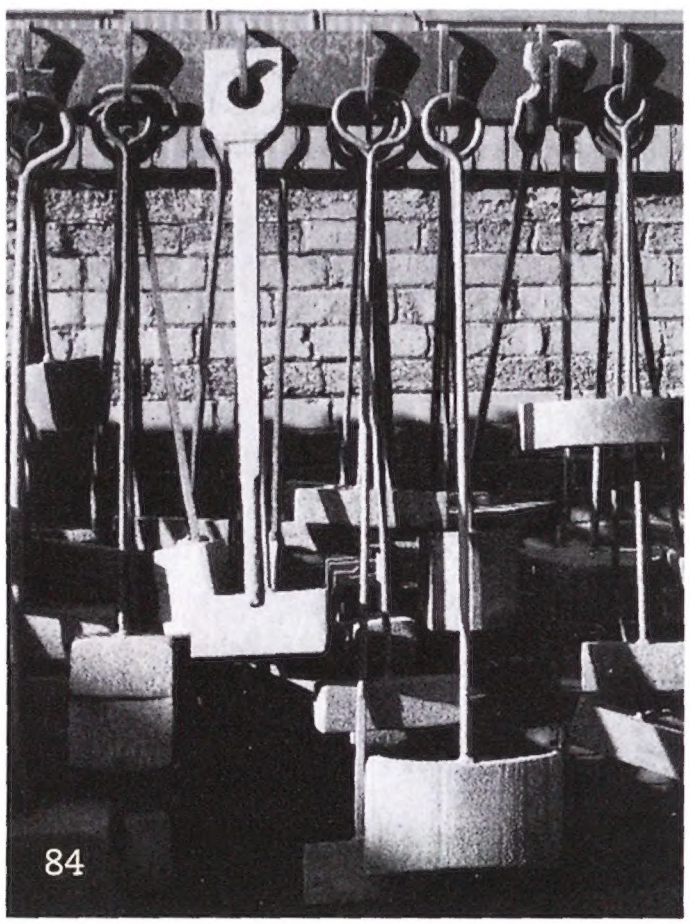


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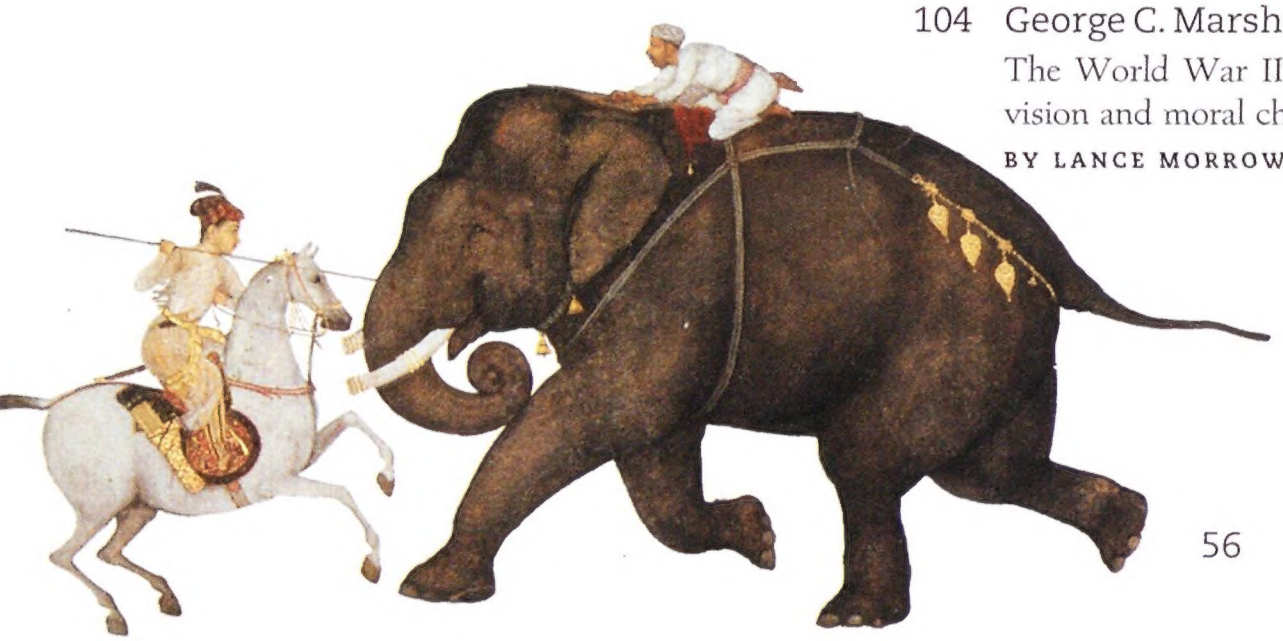


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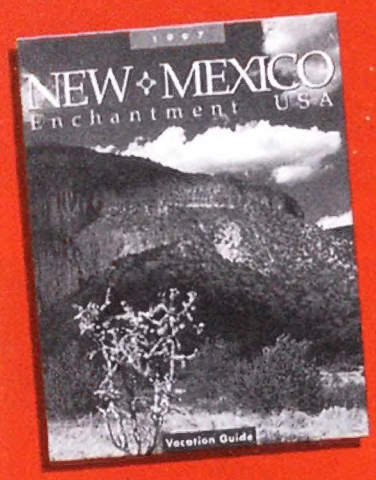


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# Her science teacher taught her about discovery. Now she's discovering ways to fight cancer.

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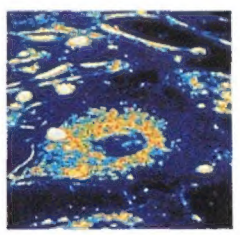
"When I was eight, my mother died. Fortunately, a biology teacher took me under his wing. He taught me a lot about science. But mostly he made me feel 'Hey, I can do this.'

"Today, I'm a pharmaceutical company researcher. At my company we're developing a new drug that may help cancer patients get their blood platelet numbers back up to normal after chemotherapy."



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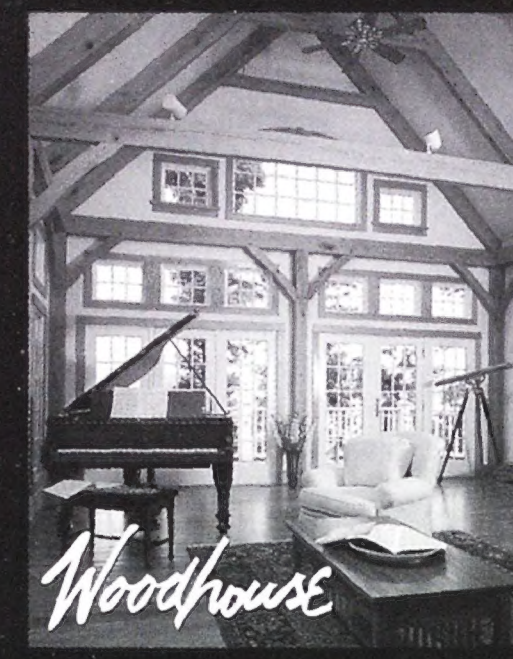


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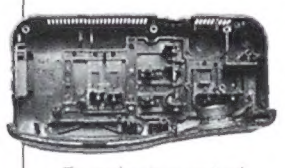
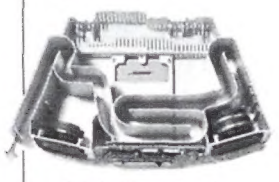


The speakers in conventional radios cannot produce lifelike bass, which is essential for great sound.



Only the Wave radio with acoustic waveguide speaker technology produces high-quality sound with full, rich bass.

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PHOTOGRAPH BY MARK PFISTER

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SMITHSONIAN

PERSPECTIVES

# Using and Taking Care Of 140 Million Items

TO CARRY OUT THE SMITHSONIAN'S MISSION FOR "THE increase and diffusion of knowledge," the Institution engages in three major activities: research, education and collections management. Collections are central and pose some of our most challenging problems. Situations differ from museum to museum, but certain themes emerge: selection criteria for growth or reduction, funds for acquisition, storage and conservation, and accessibility.

Our collections number some 140 million items. More than 122 million, or 88 percent, are natural history objects, artifacts and specimens, including 30 million insects plus about 5,000 living animals at the National Zoological Park. About 12 percent are objects of cultural and technological history, including 13 million postage stamps.

Each museum at the Smithsonian faces particular issues, and what may be a problem at one museum in no way shapes the fortunes of another. For example, the Freer Gallery of Art, which originated with Charles Lang Freer's 1906 bequest of 9,000 objects, has more than tripled its collection through acquisitions. But Freer's bequest dictates strict criteria for acquisitions and display. No Freer Gallery object may ever be exhibited outside the museum, and only objects from the Freer collection may be exhibited within the museum. The Freer allows acquisitions of Asian art but not American art. The museum possesses state-of-the-art conservation facilities and excellent storage areas, and is fortunate to have sufficient acquisition funds.

Money for acquisitions, however, is a major problem at the African Art and American Art museums. Both need to expand their collections but must compete with other museums and collectors to purchase significant objects. Moreover, each faces skyrocketing prices in the art market. The Institution allocates limited acquisition funds, but these never stretch far. At the Hirshhorn Museum and Sculpture Garden there is a growing endowment for acquisitions, but deciding what to acquire can be difficult. Fortunately, the museum has a talented curatorial staff that has a reputation for picking the best in contemporary art.

Dealing with storage and conservation is an ongoing challenge for our Natural History, Air and Space, and American History museums. At Natural History acquisition funds are rarely a problem, and more specimens are offered than accepted, but cataloguing, storing, conserving and electronically recording the huge collections are enormous tasks. Our natural history collection is the world's largest and most comprehensive. Each year we lend almost 200,000 objects and specimens to nearly every state in the Union and more than 70 countries, usually for scientific study. As the rate of extinction accelerates, our responsibility for collecting, identifying and sharing our knowledge of the world's flora and fauna increases.

To help solve Natural History's collection-management problems, the Museum Support Center opened in 1983. Built in Suitland, Maryland, at a cost of $29 million, the Support Center offers a high-tech, half-million-square-foot storage-and-conservation facility 30 minutes from the Mall.

Next door, ground was broken for the National Museum of the American Indian's Cultural Resources Center. Over the next five years almost a million items must be moved from storage in New York City to Suitland. Air and Space does not have as many objects, but many are large and expensive to restore. The ultimate solution is the 700,000-square-foot Dulles Center, which is scheduled to open in 2001 and will give the general public access, in person and electronically, to the collections and their restoration.

The National Museum of American History presents multiple challenges: it has little money for acquisitions, yet must document recent history; large objects (locomotives and industrial machinery) create storage and conservation demands; and, like all our museums, it needs an effective collection information system. A tentative agreement with the Bethlehem Steel Corporation to lend hundreds of artifacts for display in a proposed new museum of industrial history in Bethlehem, Pennsylvania (see page 84), is the beginning of what I hope will be a nationwide program to share the Smithsonian's collections with cities across America.

Clearly, digital imaging offers one of the best means to provide high-quality documentation to those using the collections. Such technology will enable greater access to them, but funding requirements are enormous.

The Smithsonian collections, like our research and exhibitions, remind us that the Smithsonian is more than the sum of its parts. We come to understand the challenges of the Institution as a whole as well as those of its constituent parts, and seek resolutions that allow us to bring our rich collections to the largest possible audience.

I. MICHAEL HEYMAN, SECRETARY

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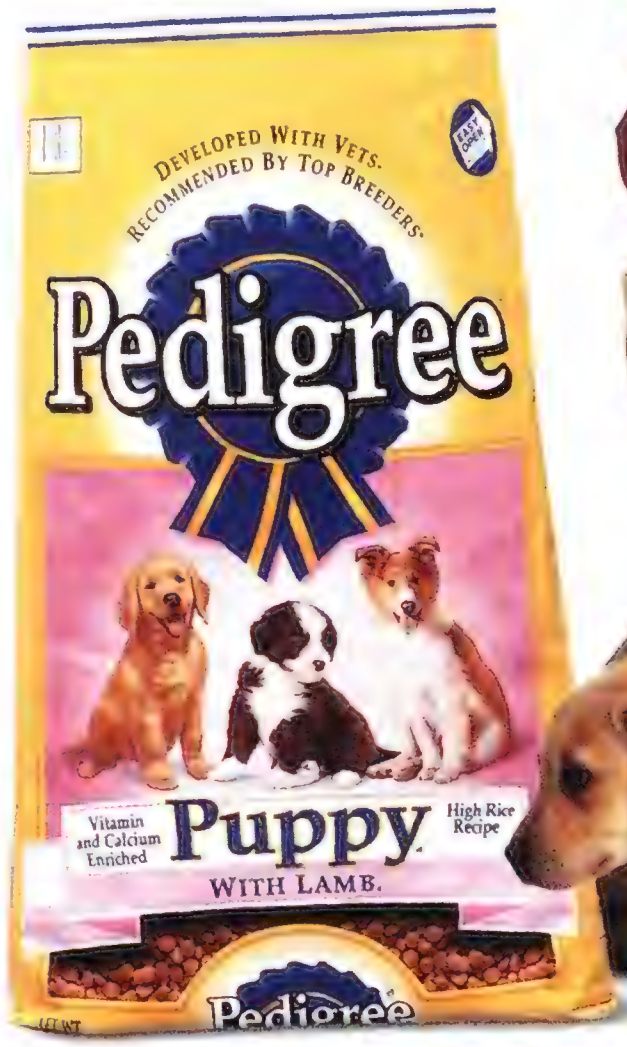


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1 pt. Male Diabetic
2 pts. Female Diabetic

☐ **Total Cholesterol Level:**
0 pts. Less than 240 mg/dL
1 pt. 240 to 315 mg/dL
2 pts. More than 315 mg/dL

☐ **HDL Level (good cholesterol):**
0 pts. 39 to 59 mg/dL
1 pt. 30 to 38 mg/dL
2 pts. Under 30 mg/dL
-1 pt. Over 60 mg/dL

☐ **Blood Pressure:**
I don't take blood pressure medication; my blood pressure is:
(*Use your top or higher blood pressure number*)
0 pts. Less than 140 mmHg
1 pt. 140 to 170 mmHg
2 pts. Greater than 170 mmHg
(or)
1 pt. I am currently taking blood pressure medication

☐ **Total Points**

**If you scored 4 points or more, you could be at above average risk of a first heart attack compared to the general adult population. The more points you score, the greater your risk.**

If you have already had a heart attack or have heart disease, your heart attack risk is significantly higher. **Only your doctor can evaluate your risk and recommend treatment plans to reduce your risk.** If you don't know your cholesterol level or blood pressure, ask your doctor if your levels should be checked.

Provided as an educational service from Bristol-Myers Squibb Company.

American Heart Association℠
*Fighting Heart Disease and Stroke*

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PRAVACHOL, in combination with diet, is proven to reduce the risk of a first heart attack, reduce the risk of death from heart disease, and reduce the need for surgery to clear blocked coronary arteries (such as bypass or angioplasty) based on a landmark study including over 6,500 males with high cholesterol and no evidence of heart disease. Because PRAVACHOL is a prescription drug, you should ask your doctor or healthcare professional if PRAVACHOL is right for you. Some mild side effects, such as slight rash or stomach upset, occur in about 2–4% of patients.

PRAVACHOL®

# Proven to help prevent first heart attacks in people with high cholesterol.

**PRAVACHOL is the only cholesterol-lowering drug of its kind proven to help prevent first heart attacks.** And the grim fact is, up to 33% of people do not survive their first heart attack. Improving your diet and exercise is an important first step, but may not be enough. So ask your doctor about PRAVACHOL. It reduces the risk of a first heart attack and the need for surgery to clear blocked coronary arteries. PRAVACHOL has been prescribed by doctors for millions of men and women worldwide. It could help you live a longer, healthier life.

**Ask your doctor** if PRAVACHOL is right for you. Or call **1-800-PREVENT** for information on *first heart attack prevention* including a free brochure from the American Heart Association. It's all provided by Bristol-Myers Squibb.

PRAVACHOL® pravastatin sodium 20 mg tablets

**Proven to help prevent first heart attacks.**

Visit our Web site at www.pravachol.com

PRAVACHOL should not be taken by women who are pregnant or nursing, people who are allergic to any of its ingredients or by anyone with liver disease. Your doctor may perform simple blood tests to check your liver function before and during treatment with PRAVACHOL. Muscle pain or weakness could be a sign of a rare but serious side effect and should be reported to your doctor right away. Be sure your doctor knows about other medications you may be taking in order to avoid any possible serious drug interactions. Please see important information on the next page.

# PRAVACHOL®

Pravastatin Sodium Tablets

**CONTRAINDICATIONS:** Hypersensitivity to any component of this medication. Active liver disease or unexplained, persistent elevations in liver function tests (see **WARNINGS**). *Pregnancy and lactation.* Atherosclerosis is a chronic process and discontinuation of lipid-lowering drugs during pregnancy should have little impact on the outcome of long-term therapy of primary hypercholesterolemia. Cholesterol and other products of cholesterol biosynthesis are essential components for fetal development (including synthesis of steroids and cell membranes). Since HMG-CoA reductase inhibitors decrease cholesterol synthesis and possibly the synthesis of other biologically active substances derived from cholesterol, they may cause fetal harm when administered to pregnant women. Therefore, HMG-CoA reductase inhibitors are contraindicated during pregnancy and in nursing mothers. **Pravastatin should be administered to women of childbearing age only when such patients are highly unlikely to conceive and have been informed of the potential hazards.** If the patient becomes pregnant while taking this class of drug, therapy should be discontinued and the patient apprised of the potential hazard to the fetus.

**WARNINGS: Liver Enzymes:** HMG-CoA reductase inhibitors, like some other lipid-lowering therapies, have been associated with biochemical abnormalities of liver function. Increases of serum transaminase (ALT, AST) values to more than 3 times the upper limit of normal occurring on 2 or more (not necessarily sequential) occasions have been reported in 1.3% of patients treated with pravastatin in the US over an average period of 18 months. These abnormalities were not associated with cholestasis and did not appear to be related to treatment duration. In those patients in whom these abnormalities were believed to be related to pravastatin and who were discontinued from therapy, the transaminase levels usually fell slowly to pretreatment levels. These biochemical findings are usually asymptomatic although worldwide experience indicates that anorexia, weakness, and/or abdominal pain may also be present in rare patients. In the largest long-term placebo-controlled clinical trial with pravastatin (Pravastatin Primary Prevention Study; See **Clinical Pharmacology**), the overall incidence of AST and/or ALT elevations to greater than three times the upper limit of normal was 1.05% in the pravastatin group as compared to 0.75% in the placebo group. One (0.03%) pravastatin-treated patient and 2 (0.06%) placebo-treated patients were discontinued because of transaminase elevations. Of the patients with normal liver function at week 12, three of 2875 treated with pravastatin (0.10%) and one of the 2919 placebo patients (0.03%) had elevations of AST greater than three times the upper limit of normal on two consecutive measurements and/or discontinued due to elevations in transaminase levels during the 4.8 years (median treatment) of the study. **It is recommended that liver function tests be performed prior to and at 12 weeks following initiation of therapy or the elevation of dose.** Patients who develop increased transaminase levels or signs and symptoms of liver disease should be monitored with a second liver function evaluation to confirm the finding and be followed thereafter with frequent liver function tests until the abnormality(ies) return to normal. Should an increase in AST or ALT of three times the upper limit of normal or greater persist, withdrawal of pravastatin therapy is recommended. Active liver disease or unexplained transaminase elevations are contraindications to the use of pravastatin (see **CONTRAINDICATIONS**). Caution should be exercised when pravastatin is administered to patients with a history of liver disease or heavy alcohol ingestion (see **CLINICAL PHARMACOLOGY: Pharmacokinetics/Metabolism**). Such patients should be closely monitored, started at the lower end of the recommended dosing range, and titrated to the desired therapeutic effect. **Skeletal Muscle: Rare cases of rhabdomyolysis with acute renal failure secondary to myoglobinuria have been reported with pravastatin and other drugs in this class.** Uncomplicated myalgia has also been reported in pravastatin-treated patients (see **ADVERSE REACTIONS**). Myopathy, defined as muscle aching or muscle weakness in conjunction with increases in creatine phosphokinase (CPK) values to greater than 10 times the upper normal limit, was rare (< 0.1%) in pravastatin clinical trials. Myopathy should be considered in any patient with diffuse myalgias, muscle tenderness or weakness, and/or marked elevation of CPK. Patients should be advised to report promptly unexplained muscle pain, tenderness or weakness, particularly if accompanied by malaise or fever. **Pravastatin therapy should be discontinued if markedly elevated CPK levels occur or myopathy is diagnosed or suspected. Pravastatin therapy should also be temporarily withheld in any patient experiencing an acute or serious condition predisposing to the development of renal failure secondary to rhabdomyolysis, e.g., sepsis; hypotension; major surgery; trauma; severe metabolic, endocrine, or electrolyte disorders; or uncontrolled epilepsy.** The risk of myopathy during treatment with another HMG-CoA reductase inhibitor is increased with concurrent therapy with either erythromycin, cyclosporine, niacin, or fibrates. However, neither myopathy nor significant increases in CPK levels have been observed in three reports involving a total of 100 post-transplant patients (24 renal and 76 cardiac) treated for up to two years concurrently with pravastatin 10-40 mg and cyclosporine. Some of these patients also received other concomitant immunosuppressive therapies. In one single-dose study, pravastatin levels were found to be increased in cardiac transplant patients receiving cyclosporine. Further, in clinical trials involving small numbers of patients who were treated concurrently with pravastatin and niacin, there were no reports of myopathy. Also, myopathy was not reported in a trial of combination pravastatin (40 mg/day) and gemfibrozil (1200 mg/day), although 4 of 75 patients on the combination showed marked CPK elevations versus one of 73 patients receiving placebo. There was a trend toward more frequent CPK elevations and patient withdrawals due to musculoskeletal symptoms in the group receiving combined treatment as compared with the groups receiving placebo, gemfibrozil, or pravastatin monotherapy (see **PRECAUTIONS: Drug Interactions**). **The use of fibrates alone may occasionally be associated with myopathy. The combined use of pravastatin and fibrates should be avoided unless the benefit of further alterations in lipid levels is likely to outweigh the increased risk of this drug combination.**

**PRECAUTIONS: General:** Pravastatin may elevate creatinine phosphokinase and transaminase levels (see **ADVERSE REACTIONS**). This should be considered in the differential diagnosis of chest pain in a patient on therapy with pravastatin. *Homozygous Familial Hypercholesterolemia.* Pravastatin has not been evaluated in patients with rare homozygous familial hypercholesterolemia. In this group of patients, it has been reported that HMG-CoA reductase inhibitors are less effective because the patients lack functional LDL receptors. *Renal Insufficiency.* A single 20 mg oral dose of pravastatin was administered to 24 patients with varying degrees of renal impairment (as determined by creatinine clearance). No effect was observed on the pharmacokinetics of pravastatin or its 3$\alpha$-hydroxy isomeric metabolite (SQ 31,906). A small increase was seen in mean AUC values and half-life ($t_{1/2}$) for the inactive enzymatic ring hydroxylation metabolite (SQ 31,945). Given this small sample size, the dosage administered, and the degree of individual variability, patients with renal impairment who are receiving pravastatin should be closely monitored. **Information for Patients:** Patients should be advised to report promptly unexplained muscle pain, tenderness or weakness, particularly if accompanied by malaise or fever. **Drug Interactions:** *Immunosuppressive Drugs, Gemfibrozil, Niacin (Nicotinic Acid), Erythromycin:* See **WARNINGS: Skeletal Muscle**. *Antipyrine:* Since concomitant administration of pravastatin had no effect on the clearance of antipyrine, interactions with other drugs metabolized via the same hepatic cytochrome isozymes are not expected. *Cholestyramine/Colestipol:* Concomitant administration resulted in an approximately 40 to 50% decrease in the mean AUC of pravastatin. However, when pravastatin was administered 1 hour before or 4 hours after cholestyramine or 1 hour before colestipol and a standard meal, there was no clinically significant decrease in bioavailability or therapeutic effect. (See **DOSAGE AND ADMINISTRATION: Concomitant Therapy**.) *Warfarin:* In a study involving 10 healthy male subjects given pravastatin and warfarin concomitantly for 6 days, bioavailability parameters at steady state for pravastatin (parent compound) were not altered. Pravastatin did not alter the plasma protein-binding of warfarin. Concomitant dosing did increase the AUC and Cmax of warfarin but did not produce any changes in its anticoagulant action (i.e., no increase was seen in mean prothrombin time after 6 days of concomitant therapy). However, bleeding and extreme prolongation of prothrombin time has been reported with another drug in this class. Patients receiving warfarin-type anticoagulants should have their prothrombin times closely monitored when pravastatin is initiated or the dosage of pravastatin is changed. *Cimetidine:* The AUC$_{0-24}$ for pravastatin when given with cimetidine was not significantly different from the AUC for pravastatin when given alone. A significant difference was observed between the AUC's for pravastatin when given with cimetidine compared to when administered with antacid. *Digoxin:* In a crossover trial involving 18 healthy male subjects given pravastatin and digoxin concurrently for 9 days, the bioavailability parameters of digoxin were not affected. The AUC of pravastatin tended to increase, but the overall bioavailability of pravastatin plus its metabolites SQ 31,906 and SQ 31,945 was not altered. *Cyclosporine:* Some investigators have measured cyclosporine levels in patients on pravastatin, and to date, these results indicate no clinically meaningful elevations in cyclosporine levels. In one single-dose study, pravastatin levels were found to be increased in cardiac transplant patients receiving cyclosporine. *Gemfibrozil:* In a crossover study in 20 healthy male volunteers given concomitant single doses of pravastatin and gemfibrozil, there was a significant decrease in urinary excretion and protein binding of pravastatin. In addition, there was a significant increase in AUC, Cmax, and Tmax for the pravastatin metabolite SQ 31,906. Combination therapy with pravastatin and gemfibrozil is generally not recommended. In interaction studies with *aspirin, antacids* (1 hour prior to PRAVACHOL), *cimetidine, nicotinic acid,* or *probucol,* no statistically significant differences in bioavailability were seen when PRAVACHOL (pravastatin sodium) was administered. *Other Drugs:* During clinical trials, no noticeable drug interactions were reported when PRAVACHOL was added to: diuretics, antihypertensives, digitalis, ACE inhibitors, calcium channel blockers, beta-blockers, or nitroglycerin. **Endocrine Function:** HMG-CoA reductase inhibitors interfere with cholesterol synthesis and lower circulating cholesterol levels and, as such, might theoretically blunt adrenal or gonadal steroid hormone production. Results of clinical trials with pravastatin in males and post-menopausal females were inconsistent with regard to possible effects of the drug on basal steroid hormone levels. In a study of 21 males, the mean testosterone response to human chorionic gonadotropin was significantly reduced ($p < 0.004$) after 16 weeks of treatment with 40 mg of pravastatin. However, the percentage of patients showing a $\geq 50\%$ rise in plasma testosterone after human chorionic gonadotropin stimulation did not change significantly after therapy in these patients. The effects of HMG-CoA reductase inhibitors on spermatogenesis and fertility have not been studied in adequate numbers of patients. The effects, if any, of pravastatin on the pituitary-gonadal axis in pre-menopausal females are unknown. Patients treated with pravastatin who display clinical evidence of endocrine dysfunction should be evaluated appropriately. Caution should also be exercised if an HMG-CoA reductase inhibitor or other agent used to lower cholesterol levels is administered to patients also receiving other drugs (e.g., ketoconazole, spironolactone, cimetidine) that may diminish the levels or activity of steroid hormones. **CNS Toxicity:** CNS vascular lesions, characterized by perivascular hemorrhage and edema and mononuclear cell infiltration of perivascular spaces, were seen in dogs treated with pravastatin at a dose of 25 mg/kg/day, a dose that produced a plasma drug level about 50 times higher than the mean drug level in humans taking 40 mg/day. Similar CNS vascular lesions have been observed with several other drugs in this class. A chemically similar drug in this class produced optic nerve degeneration (Wallerian degeneration of retinogeniculate fibers) in clinically normal dogs in a dose-dependent fashion starting at 60 mg/kg/day, a dose that produced mean plasma drug levels about 30 times higher than the mean drug level in humans taking the highest recommended dose (as measured by total enzyme inhibitory activity). This same drug also produced vestibulocochlear Wallerian-like degeneration and retinal ganglion cell chromatolysis in dogs treated for 14 weeks at 180 mg/kg/day, a dose which resulted in a mean plasma drug level similar to that seen with the 60 mg/kg/day dose. **Carcinogenesis, Mutagenesis, Impairment of Fertility:** In a 2-year study in rats fed pravastatin at doses of 10, 30, or 100 mg/kg body weight, there was an increased incidence of hepatocellular carcinomas in males at the highest dose ($p < 0.01$). Although rats were given up to 125 times the human dose (HD) on a mg/kg body weight basis, serum drug levels were only 6 to 10 times higher than those measured in humans given 40 mg pravastatin as measured by AUC. The oral administration of 10, 30, or 100 mg/kg (producing plasma drug levels approximately 0.5 to 5.0 times the human drug levels at 40 mg) of pravastatin to mice for 22 months resulted in a statistically significant increase in the incidence of malignant lymphomas in treated females when all treatment groups were pooled and compared to controls ($p < 0.05$). The incidence was not dose-related and male mice were not affected. A chemically similar drug in this class was administered to mice for 72 weeks at 25, 100, and 400 mg/kg body weight, which resulted in mean serum drug levels approximately 3, 15, and 33 times higher than the mean human serum drug concentration (as total inhibitory activity) after a 40 mg oral dose. Liver carcinomas were significantly increased in high-dose females and mid- and high-dose males, with a maximum incidence of 90 percent in males. The incidence of adenomas of the liver was significantly increased in mid- and high-dose females. Drug treatment also significantly increased the incidence of lung adenomas in mid- and high-dose males and females. Adenomas of the eye Harderian gland (a gland of the eye of rodents) were significantly higher in high-dose mice than in controls. No evidence of mutagenicity was observed *in vitro*, with or without rat-liver metabolic activation, in the following studies: microbial mutagen tests, using mutant strains of *Salmonella typhimurium* or *Escherichia coli*; a forward mutation assay in L5178Y TK +/- mouse lymphoma cells; a chromosomal aberration test in hamster cells; and a gene conversion assay using *Saccharomyces cerevisiae*. In addition, there was no evidence of mutagenicity in either a dominant lethal test in mice or a micronucleus test in mice. In a study in rats, with daily doses up to 500 mg/kg, pravastatin did not produce any adverse effects on fertility or general reproductive performance. However, in a study with another HMG-CoA reductase inhibitor, there was decreased fertility in male rats treated for 34 weeks at 25 mg/kg body weight, although this effect was not observed in a subsequent fertility study when this same dose was administered for 11 weeks (the entire cycle of spermatogenesis, including epididymal maturation). In rats treated with this same reductase inhibitor at 180 mg/kg/day, seminiferous tubule degeneration (necrosis and loss of spermatogenic epithelium) was observed. Although not seen with pravastatin, two similar drugs in this class caused drug-related testicular atrophy, decreased spermatogenesis, spermatocytic degeneration, and giant cell formation in dogs. The clinical significance of these findings is unclear. **Pregnancy: Pregnancy Category X.** See **CONTRAINDICATIONS**. Safety in pregnant women has not been established. Pravastatin was not teratogenic in rats at doses up to 1000 mg/kg daily or in rabbits at doses of up to 50 mg/kg daily. These doses resulted in 20x (rabbit) or 240x (rat) the human exposure based on surface area (mg/meter$^2$). However, in studies with another HMG-CoA reductase inhibitor, skeletal malformations were observed in rats and mice. There has been one report of severe congenital bony deformity, tracheo-esophageal fistula, and anal atresia (Vater association) in a baby born to a woman who took another HMG-CoA reductase inhibitor with dextroamphetamine sulfate during the first trimester of pregnancy. PRAVACHOL (pravastatin sodium) should be administered to women of child-bearing potential only when such patients are highly unlikely to conceive and have been informed of the potential hazards. If the woman becomes pregnant while taking PRAVACHOL (pravastatin sodium), it should be discontinued and the patient advised again as to the potential hazards to the fetus. **Nursing Mothers:** A small amount of pravastatin is excreted in human breast milk. Because of the potential for serious adverse reactions in nursing infants, women taking PRAVACHOL should not nurse (see **CONTRAINDICATIONS**). **Pediatric Use:** Safety and effectiveness in individuals less than 18 years old have not been established. Hence, treatment in patients less than 18 years old is not recommended at this time.

**ADVERSE REACTIONS:** Pravastatin is generally well tolerated; adverse reactions have usually been mild and transient. In 4-month long placebo-controlled trials, 1.7% of pravastatin-treated patients and 1.2% of placebo-treated patients were discontinued from treatment because of adverse experiences attributed to study drug therapy; this difference was not statistically significant. In long-term studies, the most common reasons for discontinuation were asymptomatic serum transaminase increases and mild, non-specific gastrointestinal complaints. During clinical trials the overall incidence of adverse events in the elderly was not different from the incidence observed in younger patients. **Adverse Clinical Events:** All adverse clinical events (regardless of attribution) reported in more than 2% of pravastatin-treated patients in the placebo-controlled trials are identified in the table below; also shown are the percentages of patients in whom these medical events were believed to be related or possibly related to the drug

| | All Events | | Events Attributed to Study Drug | |
|---|---|---|---|---|
| **Body System/Event** | **Pravastatin (N = 900) %** | **Placebo (N = 411) %** | **Pravastatin (N = 900) %** | **Placebo (N = 411) %** |
| Cardiovascular | | | | |
| Cardiac Chest Pain | 4.0 | 3.4 | 0.1 | 0.0 |
| Dermatologic Rash | 4.0* | 1.1 | 1.3 | 0.9 |
| Gastrointestinal | | | | |
| Nausea/Vomiting | 7.3 | 7.1 | 2.9 | 3.4 |
| Diarrhea | 6.2 | 5.6 | 2.0 | 1.9 |
| Abdominal Pain | 5.4 | 6.9 | 2.0 | 3.9 |
| Constipation | 4.0 | 7.1 | 2.4 | 5.1 |
| Flatulence | 3.3 | 3.6 | 2.7 | 3.4 |
| Heartburn | 2.9 | 1.9 | 2.0 | 0.7 |
| General | | | | |
| Fatigue | 3.8 | 3.4 | 1.9 | 1.0 |
| Chest Pain | 3.7 | 1.9 | 0.3 | 0.2 |
| Influenza | 2.4* | 0.7 | 0.0 | 0.0 |
| Musculoskeletal | | | | |
| Localized Pain | 10.0 | 9.0 | 1.4 | 1.5 |
| Myalgia | 2.7 | 1.0 | 0.6 | 0.0 |
| Nervous System | | | | |
| Headache | 6.2 | 3.9 | 1.7* | 0.2 |
| Dizziness | 3.3 | 3.2 | 1.0 | 0.5 |
| Renal/Genitourinary | | | | |
| Urinary Abnormality | 2.4 | 2.9 | 0.7 | 1.2 |
| Respiratory | | | | |
| Common Cold | 7.0 | 6.3 | 0.0 | 0.0 |
| Rhinitis | 4.0 | 4.1 | 0.1 | 0.0 |
| Cough | 2.6 | 1.7 | 0.1 | 0.0 |

*Statistically significantly different from placebo

In the Pravastatin Primary Prevention Study (West of Scotland Coronary Prevention Study) (see **CLINICAL PHARMACOLOGY: Clinical Studies**) involving 6595 patients treated with PRAVACHOL (pravastatin sodium) (N = 3302) or placebo (n = 3293) the adverse event profile in the pravastatin group was comparable to that of the placebo group over the median 4.8 years of the study. The following effects have been reported with drugs in this class, not all the effects listed below have necessarily been associated with pravastatin therapy: *Skeletal:* myopathy, rhabdomyolysis, arthralgia. *Neurological:* dysfunction of certain cranial nerves (including alteration of taste, impairment of extra-ocular movement, facial paresis), tremor, vertigo, memory loss, paresthesia, peripheral neuropathy, peripheral nerve palsy, anxiety, insomnia, depression. *Hypersensitivity Reactions:* An apparent hypersensitivity syndrome has been reported rarely which has included one or more of the following features: anaphylaxis, angioedema, lupus erythematous-like syndrome, polymyalgia rheumatica, dermatomyositis, vasculitis, purpura, thrombocytopenia, leukopenia, hemolytic anemia, positive ANA, ESR increase, eosinophilia, arthritis, arthralgia, urticaria, asthenia, photosensitivity, fever, chills, flushing, malaise, dyspnea, toxic epidermal necrolysis, erythema multiforme, including Stevens-Johnson syndrome. *Gastrointestinal:* pancreatitis, hepatitis, including chronic active hepatitis, cholestatic jaundice, fatty change in liver, and, rarely, cirrhosis, fulminant hepatic necrosis, and hepatoma; anorexia, vomiting. *Skin:* alopecia, pruritus. A variety of skin changes (e.g., nodules, discoloration, dryness of skin/mucous membranes, changes to hair/nails) have been reported. *Reproductive:* gynecomastia, loss of libido, erectile dysfunction. *Eye:* progression of cataracts (lens opacities), ophthalmoplegia. *Laboratory Abnormalities:* elevated transaminases, alkaline phosphatase, and bilirubin; thyroid function abnormalities. **Laboratory Test Abnormalities:** Increases in serum transaminase (ALT, AST) values and CPK have been observed (see **WARNINGS**). Transient, asymptomatic eosinophilia has been reported. Eosinophil counts usually returned to normal despite continued therapy. Anemia, thrombocytopenia, and leukopenia have been reported with HMG-CoA reductase inhibitors. **Concomitant Therapy:** Pravastatin has been administered concurrently with cholestyramine, colestipol, nicotinic acid, probucol and gemfibrozil. Preliminary data suggest that the addition of either probucol or gemfibrozil to therapy with lovastatin or pravastatin is **not** associated with greater reduction in LDL-cholesterol than that achieved with lovastatin or pravastatin alone. No adverse reactions unique to the combination or in addition to those previously reported for each drug alone have been reported. Myopathy and rhabdomyolysis (with or without acute renal failure) have been reported when another HMG-CoA reductase inhibitor was used in combination with immunosuppressive drugs, gemfibrozil, erythromycin, or lipid-lowering doses of nicotinic acid. Concomitant therapy with HMG-CoA reductase inhibitors and these agents is generally not recommended. (See **WARNINGS: Skeletal Muscle** and **PRECAUTIONS: Drug Interactions**.)

**OVERDOSAGE:** To date, there are two reported cases of overdosage with pravastatin, both of which were asymptomatic and not associated with clinical laboratory abnormalities. If an overdose occurs, it should be treated symptomatically and supportive measures should be instituted as required.

**CAUTION: Federal (USA) law prohibits dispensing without prescription.**

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J4-538F

### FLAGS

I ENJOYED RICHARD WOLKOMIR'S ARTICLE in June about Whitney Smith and his lifelong love of flags.

In June 1945, the Japanese moved all of the American officers from a multinational POW camp in Zentsuji on the Japanese island of Shikoku to Roku Roshi, high in the Japanese Alps on the main island of Honshu. Among those in the group were captives from Guam, Wake, Corregidor and Midway, and survivors of the Bataan Death March, including me. The new camp was bleak, and we heard a rumor that the snow the previous winter had been 20 feet deep. Over the camp flew the Japanese flag.

In August, upon receiving word that the Japanese had surrendered, we tore down the camp's flag. A naval officer among us brought out a canvas pillow filled with rice husks that he had made like the ones the Japanese used. He opened it, and, to the astonishment of the rest of us ex-POWs, he pulled out the Stars and Stripes. He had carried the flag with him ever since his surrender with the rest of the Navy forces on Guam on December 10, 1941, and had managed to conceal it despite innumerable searches throughout all his years of captivity. We raised the glorious banner, and tears streamed down my cheeks and those of most of the other men as we gazed in awe at the most beautiful sight in our lives.

*Thomas Griffin*
*Washington, D.C.*

YOUR EXCELLENT ARTICLE HAS ONE vexing lacuna: no mention of the ancient flags described in the Bible. In Numbers 1:52 and 2:2, we are told that while the Children of Israel traveled through the desert for 40 years, each tribe carried a standard "with the ensign of their father's house."

*Eliezer N. Eisenberg*
*Chicago, Illinois*

### FIRST DOGS

I ENJOYED THE ESSAY ABOUT THE upcoming book *First Dogs: American Presidents and Their Best Friends*. I was particularly interested in Warren G. Harding's Airedale, Laddie Boy, who was pictured in his own hand-carved Cabinet chair. Before Harding became President, he and his wife had been

newspaper publishers in Marion, Ohio. When he died in 1923, newsboys around the country contributed pennies toward a memorial, a statue of the First Dog. Where is Laddie Boy today? He deserves to find his place, just as FDR's Fala has. After all, he was never indicted or convicted, which is more than can be said of some others who sat in Cabinet chairs during the Harding Administration.

*Leonard Rapport*
*Washington, D.C.*

**Laddie Boy (above) is right here in the Ceremonial Court of the National Museum of American History. The Roosevelt Newsboys' Association of Lynn, Massachusetts, collected 103.5 pounds of pennies during its fundraising campaign. After these were melted down, artist Bashka Paeff cast the bronze statue of Laddie Boy. It was a gift for Mrs. Harding, but she died shortly before the statue was finished. The Newsboys' Association gave it to the Smithsonian Institution on January 29, 1927. Laddie Boy died on January 23, 1929. Ed.**

IN YOUR LIVELY EXCERPT OF BROOKE Janis' and my book *First Dogs*, you wondered whether "Bill Clinton shouldn't change his Socks." When he was governor of Arkansas, Clinton did have a cute blond cocker spaniel named Zeke. Unfortunately, Zeke was run over before he could be given the run of the White House. Of course, if Clinton heeds a predecessor's warning, he'll hightail it out and find a canine replacement. "Any man who does not like dogs and want them about," claimed Cal Coolidge, "does not deserve to be in the White House."

*Roy Rowan*
*Greenwich, Connecticut*

### MALPAI BORDERLANDS GROUP

I JUST READ JAKE PAGE'S ARTICLE about the Arizona ranchers of the Malpai Borderlands Group and their innovative approach to land and species conservation. I am glad to see that after so many years of conflict, the government, ranchers and environmentalists are finally realizing that we can all work together.

Here in Washington State, I have been involved with the conservation of native cacti for many years. Ranchers and farmers have been very cooperative in allowing me access to their properties to observe and study the *Pediocactus nigrispinus* and other cactus species. I always explain that their rights as property owners come first. Respect and an open line of communication can go a long way in improving the rancher-conservationist relationship. Most of the ranchers do not disagree with conser-

vation but rather with the extreme approach some individuals use. We must remember that not all ranchers are nature-haters any more than all environmentalists are "tree huggers."

*Dixie A. Dringman*
*Wenatchee, Washington*

THE NATIONAL WILD TURKEY FEDERATION (NWTF) is working closely with several groups to restore the Gould's wild turkey, which you mentioned in your article, to the Galiuro Mountains in southeastern Arizona. This cooperative effort involves not only the NWTF but also the U.S. Fish and Wildlife Service, the ranchers who graze the land, the Arizona Game and Fish Department, and the Centro Ecológico de Sonora in Mexico.

*Rob Keck*
*Executive Vice President/CEO*
*National Wild Turkey Federation*
*Edgefield, South Carolina*

### MAGINOT LINE

RUDOLPH CHELMINSKI'S ARTICLE ABOUT the Maginot Line pulled me back to December 1944 when I was in the 398th Infantry, Company L. As he wrote, one of the uses the Germans made of the Line was "against the Americans during the Ardennes offensives." The 398th Infantry, 100th Division, took the hinge of the Maginot Line at Bitche in the Ardennes after several days of fierce fighting in December 1944, capturing Forts Freudenburg and Schiesseck.

The survivors proudly call themselves the "Sons of Bitche." (I am not a Son of Bitche; I was knocked out of action before the assault—a week before turning 19.) The unit received a citation for outstanding performance in combat for breaching the Maginot Line west of Bitche.

*Donald R. Wood*
*Lake Forest, Illinois*

IN DECEMBER 1944, I SAW THE ACTION against a hydraulic pillbox that was part of the formidable Fort Schiesseck complex near Bitche, France. As an 81-millimeter-mortar observer for Company D, 399th Infantry, I had a panoramic view from a ridge. U.S. planes tried repeatedly but unsuccessfully to knock out the pillbox. An artillery shell jammed it in the "up" position only to have the next shell loosen it again. A U.S. tank fought a dramatic duel with elevator-operated cannon, firing at the disappearing turret and rapidly moving away to avoid being fired upon. Ground troops from the 398th, 100th Division, finally reached the pillbox and threw explosives into the cannon, blowing it open. Some of our men got into Fort Schiesseck to explore, but they didn't linger since German soldiers remained in some of the levels below them.

*Scott Tidswell*
*Lamar, Colorado*

### PIZZA

JAY STULLER'S TAKEOUT ON PIZZA SURE does cover the hot-oven bricks about the subject, including its history and etymology. But returning veterans don't deserve all the credit for pizza's post-WWII appeal to Americans. Long before the G.I. honed his palate on this appetizing peasant *cucina*, people in the northern reaches of the Bronx were consuming what they called *a-beetz*—Sicilian dialect for *la pizza*.

*James C. G. Conniff*
*Upper Montclair, New Jersey*

FOR MORE THAN THREE DECADES, ENDing in the 1960s, there was an excellent Italian restaurant in the south part of Queens, New York, that attracted a clientele from far and wide. All of its food earned it an enviable reputation, but its pizza was especially noteworthy for its unique piecrust. Just before he retired, the owner revealed two things to me. First, he was not Italian as everyone believed but Jewish. Second, the secret to his pizza crust was to add sour cream to the dough, an old Jewish baking technique.

*Alex Ekhaus*
*Far Rockaway, New York*

### AROUND THE MALL AND BEYOND

MICHAEL KERNAN'S COLUMN ON KITES brought back a triumphant childhood memory. In 1939 I entered the dogfighting category of a kite-flying contest. I built a standard diamond-shaped dogfighter and lined the top edge with razor blades for cutting my opponent's kite string.

My opponent pulled his box kite high over mine, made a looping dive well wide of my kite and then swooped his sideways, crippling mine with a crushing blow. I was able to right it and, with a mighty pull from beneath the box kite, zoomed mine sharply upward and cut the box kite's strings. Victory!

*Robert R. Loomis*
*Sunnyvale, California*

### DUNG BEETLES

DAVID HOLZMAN MENTIONED TEXAS "scuffle bugs" in his article, but he evidently wasn't aware of the Texas town of Bug Tussle, which was named after dung beetles. According to *The New Handbook of Texas*, one explanation is that two longtime residents of Truss were arguing about changing the town's name. "Their attention was diverted by the spectacle of two tumblebugs fighting. 'Look at those bugs tussle,' one reportedly remarked, thus settling the argument and rechristening the town."

*Billie Bob Crim*
*Kilgore, Texas*

YOUR AMUSING AND INFORMATIVE ARTIcle inspired this encomium: Consider the beetle of dung / Whose praises need to be sung. / This industrious species / Buries animal feces / Which all other beasts have flung.

*Joshua M. Levine*
*Washington, D.C.*

**Letters for consideration in this column must include your full name, telephone number and postal address. Letters may be edited for clarity and length. Post mail to Letters Editor, SMITHSONIAN, 900 Jefferson Drive, MRC 406, Washington, DC 20560 or transmit it to edletters@aol.com.**

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THE OBJECT

AT HAND

# John Brown's Picture

## A LONG-LOST DAGUERREOTYPE, MADE BY A BLACK ARTIST IN 1847, HAS LATELY COME TO REST AT THE SMITHSONIAN

BY EDWARDS PARK

"HE IS OF IMPOSING APPEARANCE . . . TALL, WITH SQUARE shoulders . . . eyes of deep gray, and couchant, as if ready to spring at the least rustling. . . ." So John Brown struck Bronson Alcott, mystical transcendentalist and father of Louisa May, author of *Little Women*. In his epic *John Brown's Body*, poet Stephen Vincent Benét was a bit cooler of eye. For him John Brown was:

*A stone eroded to a cutting edge*
*By obstinacy, failure and cold prayers...*
*And with a certain minor-prophet air*
*That fooled the world to thinking him half-great*
*When all he did consistently was fail.*

John Brown is clean-shaven and intent in a daguerrotype (left) by Augustus Washington; in Curry's 1941 mural he is a Bible-brandishing avenger.

NOW, FOR THOSE WHO WANT TO judge for themselves, or compare the way he really looked with artist John Steuart Curry's stagy portrait, or with Raymond Massey's depiction in the 1940 film (p. 20), a four-inch-high daguerreotype of him, lately acquired by the Smithsonian, is on view at the National Portrait Gallery. In the picture, John Brown stands tall, square, stony and half-great. The portrait is the earliest likeness known of America's most famous and controversial abolitionist. It was made by a talented daguerreotypist, Augustus Washington, probably in 1847 when Brown was 47 years old and working as a wool broker in Springfield, Massachusetts. Every button on his waistcoat, every stern wrinkle in his brow, even the life line on his upraised palm, is precisely shown.

The original daguerreotype only recently came to light in Pittsburgh, Pennsylvania, where the Smithsonian snapped it up with the help of funds given by Mr. and Mrs. Lloyd G. Schermer. Mrs. Schermer's great-grandfather was with John Brown in Kansas in the 1850s.

John Brown spent his earliest years in northwestern Connecticut. When the boy was 5, his father, scrabbling for a living as a tanner, moved the family to Ohio. During the War of 1812, the elder Brown entrusted his 12-year-old son with driving cattle more than 100 miles to Detroit to sell to American troops. While on that trip he watched a black slave boy his age being beaten with an iron fire shovel; he was so shocked by the sight that he vowed to become slavery's "most *determined* foe."

Brown was largely self-taught, a humorless young man with a knack for judging wool by its feel. He was certain he could command top prices from the mills then sprouting in the Northeast, but his wool brokerage turned out to be just one of Brown's 15 business failures.

By the time of this portrait, America's "peculiar institution" was becoming an embarrassment to Northeastern manufacturers who dealt with disapproving Europeans. Brown's obsessive hatred of slavery intrigued many wealthy Northern abolitionists who had various ideas about how to break slavery's grip. The American Colonization Society wanted to take freed slaves, give them schooling and send them to Africa. The Underground Railroad hid runaways by day, hurrying them north by night to freedom in Canada.

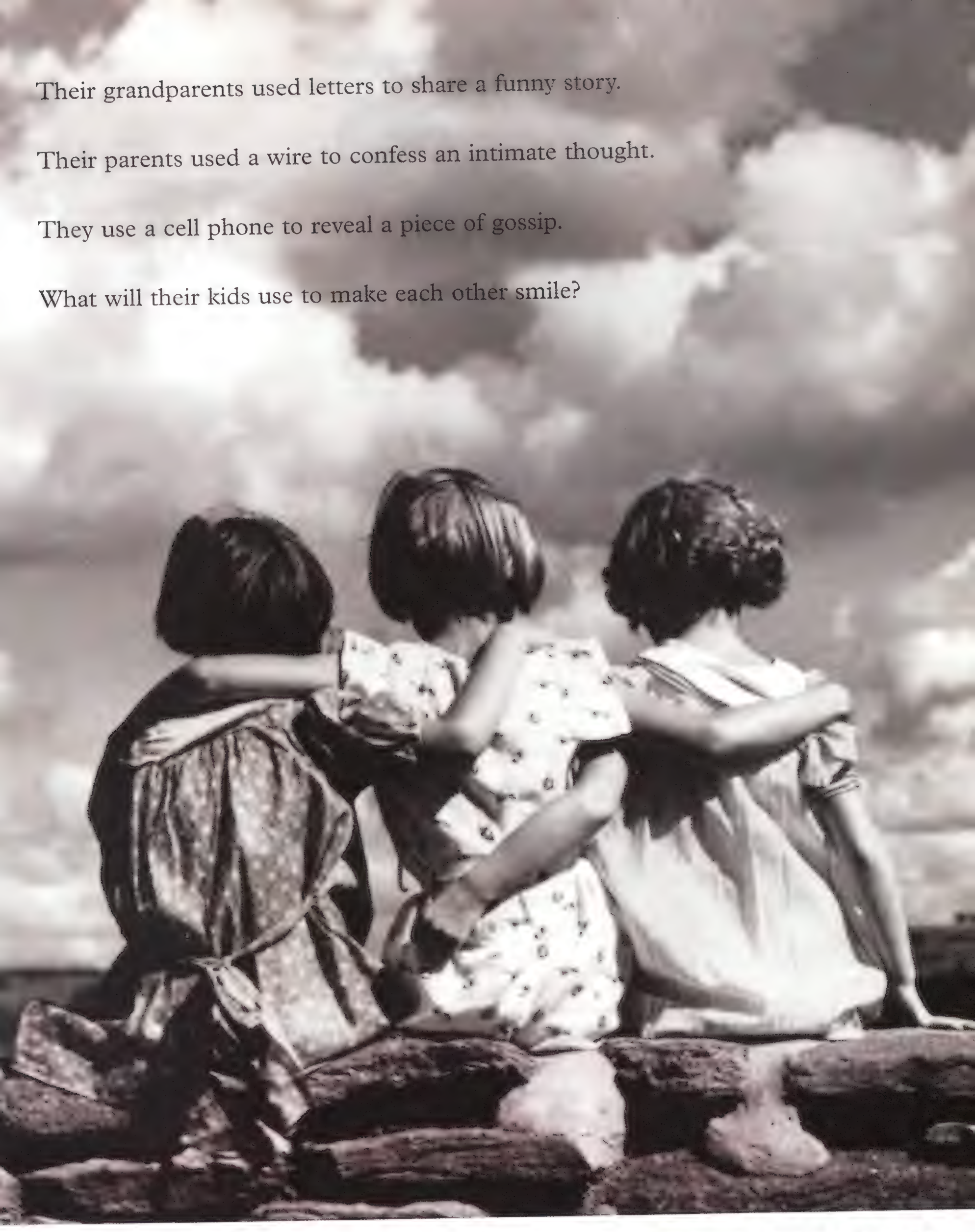
Abolishing slavery by federal law was hopeless: Southerners were too strong in Congress, and until the 1850s most Northerners didn't really care. Abolitionists were regarded as crazy radicals. Frederick Douglass, former slave and emi-

Their grandparents used letters to share a funny story.

Their parents used a wire to confess an intimate thought.

They use a cell phone to reveal a piece of gossip.

What will their kids use to make each other smile?



What's next?

SONY

nent antislavery spokesman, wanted to convince slave owners that they must end slavery in part because it was against God's will. John Brown as well feared God but was dead sure the deity had recruited him as avenging angel to end the national evil with sword rather than persuasion.

In 1850, as part of a compromise that declared California would join the Union as a free state, Congress beefed up the old fugitive slave law; slaveholders could nab runaways anywhere in the nation and return them to their owners. In New England, Emerson, Thoreau and Wendell Phillips preached outrage and defiance in essays and oratory, Whittier in poems, and Congregational minister Theodore Parker in his pulpit. For his part, John Brown saw the fugitive slave law as a divine testing. Had not Gideon and his army suffered trials before God persuaded him to face the Midianites and "set every man's sword against his fellow"?

In 1854 the Kansas-Nebraska Act allowed the two future states to decide by popular vote whether to accept slavery. Pro-slavery "Ruffians" from Missouri poured over the border into the Kansas Territory to pack the polls. In reply, New England abolitionists began grubstaking Free-Soilers who trundled west and set up the town of Lawrence, now seat of the University of Kansas. Locals sacked it. A heavy shipment marked "Bibles" reached the Free-Soilers. It came from the Rev. Henry Ward Beecher, brother of Harriet Beecher Stowe who wrote *Uncle Tom's Cabin*. The beleaguered recipients, sighing at the futility of such pious gifts, pried open the crates and rejoiced at all the splendid new Sharps rifles. They dubbed the guns "Beecher's Bibles."

To "Bleeding Kansas" now came grim-faced, obsessive John Brown, following a group of his sons (he ended up fathering 20 children, 13 from his second wife). In Osawatomie, on Pottawatomie Creek, some 30 miles south of today's sprawl of Kansas City, Kansas, the old man created and captained a guerrilla band, the Liberty Guards, to revenge the sack of Lawrence. On a spring night in 1856, Brown led a raid of his own "to steal a march on the slave hounds." Storming into scattered prairie cabins, his band savagely killed five people. Abolitionists twisted this "Pottawatomie Massacre" to improve the image of their cause, but in the eyes of many Americans it branded Brown as a fanatic and even a murderer.

Daguerreotypist Augustus Washington probably never learned of Brown's massacre. Washington was the son of a former slave and an Asian mother, and when the massacre occurred, he was living in Liberia. Only in Africa, he noted, could he "find a home." But when he was 22, in 1843, Dartmouth had accepted him. To help pay expenses Washington learned daguerreotyping, doing portraits of students, faculty and townsfolk in Hanover, New Hampshire. He had to quit school before graduating, and settled in Hartford, Connecticut. There, he opened a studio in 1847. John Brown was one of his first customers.

**Holed up at Harpers Ferry, in a 1940 film, Brown (Raymond Massey) is a fanatical prophet of the bloody war soon to come.**

He was renowned in Hartford as "an artist of fine taste and perception," but he constantly chafed at having to pay taxes, especially because, as a free person of color, he did not have the right to vote. In 1853, he gave up his Hartford studio and sailed for Liberia with his wife and three children.

In 1858 Brown began recruiting for a great new mission. He gathered funds from six wealthy Northeasterners—the "Secret Six"—and in the summer of '59 moved with 21 followers to a rented farm close to Harpers Ferry, Virginia. First step: seize the federal armory in Harpers Ferry, then wait for thousands of slaves to rally, arm themselves and make war upon their masters. He was now famous (or infamous, depending on your viewpoint). People noticed him, especially with the long beard he'd grown. Some of his advisers warned him of imminent catastrophe. Conjecture about what he was up to flew from Harpers Ferry to the halls of Congress. As a result, his last adventure—still a familiar episode in history—was long foreseen.

On the evening of October 16, 1859, Brown led his group into Harpers Ferry, seized the arsenal and Hall's Rifle Works, captured some hostages and waited for slaves to revolt. They didn't, but very quickly news of the raid spread. Outraged townsmen and militia besieged the raiders. Guns blazed and bullets whistled all night and the next day. Brown moved his people into the firehouse. Outside, the battle turned into a bloody carnival. Hooting civilians swigged from bottles as they used two dead abolitionist raiders for target practice.

On October 18, U.S. marines arrived, led by an Army colonel named Robert E. Lee. Brown versus Lee. Both rebels, one present, one future. Lee's aide, Lieut. J.E.B. "Jeb" Stuart, approached the firehouse under a white flag, for a parley. But the old man asked ridiculous terms, and Stuart signaled the marines and stepped out of the way as they crashed in.

So ended Brown's Rebellion. At his trial, Brown found at last the sounding board for his revolt against "this slave country" with its "wicked, cruel, and unjust enactments." He was hanged on December 2, a mere two months after he lit the fuse of war and, as he thought, saw it sputter out. "The crimes of this guilty land," he wrote, before mounting the scaffold, "will never be purged away but with blood." And this time history proved him right.

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# The Space Race

ONETIME RIVALS ARE NOW PARTNERS. A NEW EXHIBITION AND AN IMAX FILM, *MISSION TO MIR*, TELL THE STORY

BY MICHAEL KERNAN

Aleksei Leonov was first to "walk" in space—and first to very nearly die there; he almost couldn't get back inside. Above: His training air lock and spacesuit.

EVEN OVER THE BABEL OF HUGE crowds in the National Air and Space Museum I hear an irritating little *beep-beep-beep*, the sound of *Sputnik*. That beep and the 1957 newspapers with their big black banners screaming that the Soviets had won the race into space introduce a fascinating new exhibition, "Space Race."

I remember, as an editor on a suburban California daily, watching the stream of wire copy pour out all that day, October 4, as a shocked America tried to understand that we no longer led the world in *everything* but had been beaten—beaten!—by Communists. I remember when San Francisco columnist Herb Caen soon afterward coined the word "beatnik." And I remember the terrible false rumor that swept the country, about a ham radio operator hearing voices from space, panicked voices speaking Russian, apparently a crew that had been shot out there and couldn't get back and were headed for deep space.

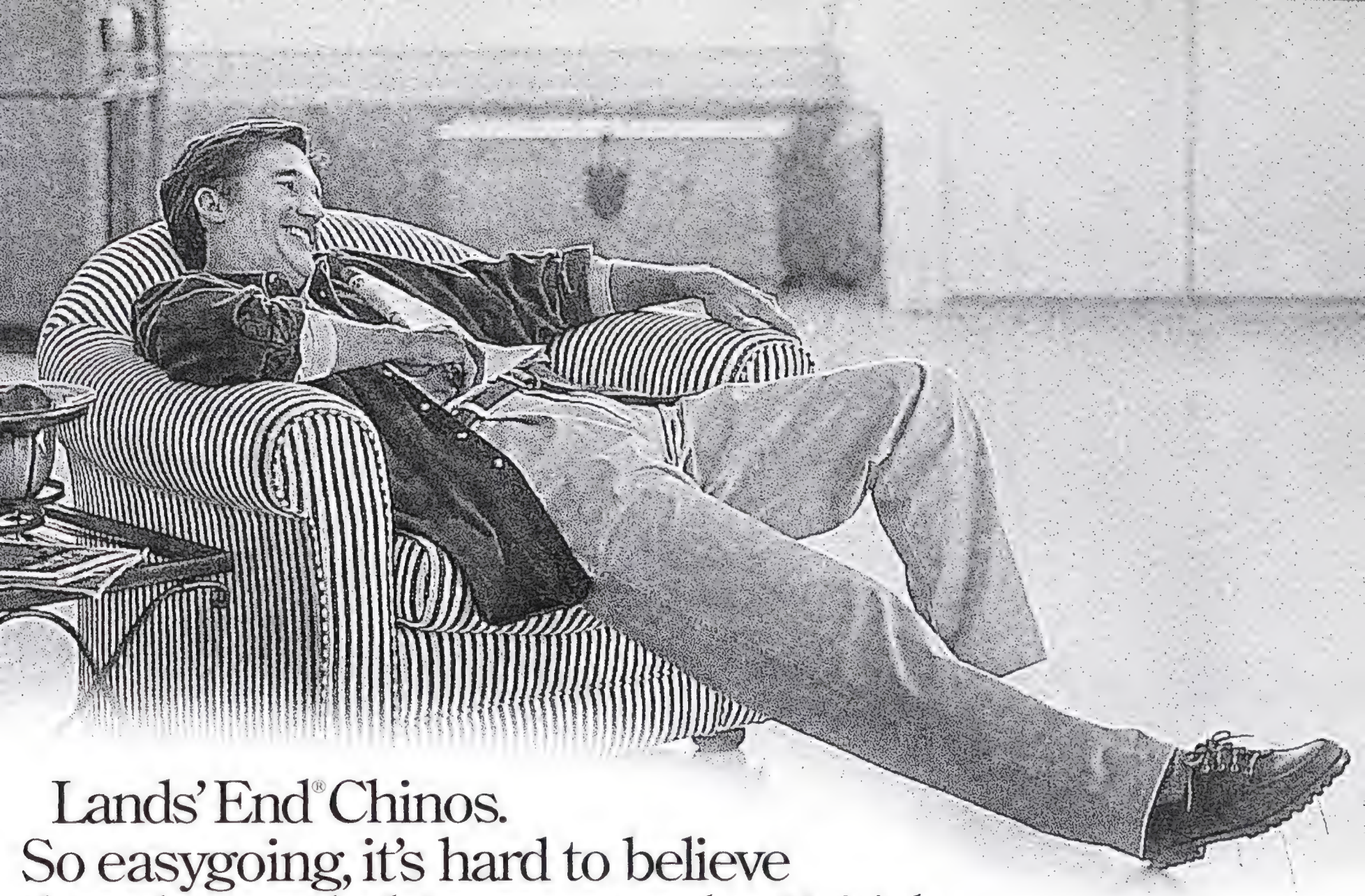
The other day I saw the latest Imax film, *Mission to Mir*, which is now premiering in 150 theaters around the world. It is a magnificent, stirring tribute to Russian-American cooperation at space station *Mir* (peace), with cosmonauts and astronauts working together and singing "Moscow Nights" together to guitar accompaniment and all of them cheering for Shannon Lucid after her record 188 days in space.

It is a happy ending to a harrowing story that began back there in '57. Cathleen Lewis, NASM curator of Soviet space history, is taking me through "Space Race," which starts with the German V-2 rockets, the kind used against London in World War II. The Cold War was just starting when, fearing capture by vengeful Russians, rocket specialist Wernher von Braun turned himself in to the Allies in '45, while the Soviets took over the rocket testing facilities at Peenemünde along with some other German scientists.

In the '50s America concentrated on long-range bombers like the B-52 of *Dr. Strangelove* fame while the Soviets focused their efforts on developing intercontinental ballistic missiles. The Soviets moved quickly ahead. *Sputnik II*, just a month after the first one, carried a dog named Laika.

This was a triple shock: not only were they beating us again, but they were going to let the dog die up there! Godless Communists. And, most important, it was becoming clear that they were capable of sending up heavier payloads—like a nuclear warhead.

Before we'd got over that, the Soviets in rapid succession: sent the first probe to the moon and got first-ever photographs of the far side, put the first man in space, and then the first



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It was 1846. And Lt. Harry Lumsden sweltered in the heat of the Punjab, on India's northwest frontier. His scarlet tunic – a heavy felt – gave no relief.

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Of course, fabric alone does not a pair of chinos make. It's also a matter of fit and tailoring.

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woman, and took the first space walk. It was 1961 before we heard John F. Kennedy even talk about putting a man on the moon.

Through the '60s, the Soviets denied that they were trying to reach the moon, too, but we now know that they intended just that. They built a lunar module almost exactly like ours and a moon suit prototype like ours. Learning of these secret efforts, America redoubled its efforts. Again and again Soviet moon rockets fizzled on the pad at the same time our Apollos were routinely succeeding in their missions. The main reason, Lewis explains, is clear from the models of the rival rockets that stand side by side in the exhibition. The American missile has

The Soviet Merkur spacecraft was designed for reconnaissance. Both countries considered sending spies into orbit.

five gigantic engines; the Soviet one has 30 smaller ones. "They simply couldn't dedicate the resources needed for larger engines, the engineers and industrial infrastructure, the exotic alloys and such," Lewis tells me. Though their N-1 rocket had one-fourth more power than our Saturn 5, the 30 engines could not be synchronized precisely enough.

Among the wonderful historic artifacts in this exhibition are Von Braun's slide rule. And, Lewis gestures, "an almost identical one owned by Sergei

*They were beating us again, and they were going to let the dog die up there!*

Korolev, his opposite number, whose very existence was kept secret by the Soviets till after his death." Good lord, I haven't seen a slide rule in 20 years. The buggy whip of the electronic age. They got those things up into space with slide rules?

Other things I never expected to see on display in the United States:

◆ A Russian spacesuit with a small dagger for fighting off bears and wolves, since the Soviets, having decided against ocean landings, needed to equip their cosmonauts for rural landings in the U.S.S.R.

◆ A mannequin named Ivan Ivanovich (John Doe), sent up to test the resistance of Vostok life-support systems to the 10-G impact of landing. It is so lifelike that someone felt compelled to write "Model" on its forehead lest a peasant try to revive it. This dummy might have been what those excited Russian voices in the ham radio rumor were shouting about. The operator had probably heard Soviet flight controllers.

◆ Yuri Gagarin's ID card as Cosmonaut No. 01, and his training suit, alongside John Glenn's actual spacesuit. The suits are the same size—though Gagarin was about 5 feet 4 and Glenn 5 feet 10½—because the Russians used natural rubber and we used synthetic rubber, which has stiffened too much to fit around a Glenn-size mannequin.

◆ The training air lock and spacesuit that Aleksei Leonov used in preparation for the first space walk in 1965. "In the vacuum of space, the suit expanded more than expected," Lewis explains, "so he had to vent some oxygen to fit back through the air lock. The situation was almost catastrophic because he was a few minutes from the cutoff point over Kamchatka where the control people would lose him, and he had no flashlight for when he went out of the sun's light. It was hairy."

◆ A Soviet moon suit, complete with a built-in life-support backpack.

◆ A beautiful softball-size navigation globe, a miniature planetarium.

◆ A doll autographed by an early cosmonaut, optimistically dated the day he expected to return from space. His capsule accidentally depressurized, killing him and two others.

Another part of "Space Race" features our Corona satellite, a secret space camera that was declassified just two years ago. This camera, with its three-inch-wide film, took 800,000 stereoscopic photographs from space, the film canisters ejected and snatched from the air at 60,000 feet to avoid capture.

A video depicts Oklahoman Thomas Stafford and Leonov reminiscing about the first joint American-Soviet spaceflight, Apollo-Soyuz, in 1975. The Soviets had watched our progress for years, Leonov said, and the cosmonauts actually cheered when we landed on the moon. On the mission they co-commanded, Stafford and Leonov jested that they spoke three languages: Russian, English . . . and Oklahoman.

*Mission to Mir* briefly reviews the Cold War years. After that chilling era came back to me during the movie, it was especially heartwarming to then watch Americans and Russians working and laughing together aboard *Mir*, especially Shannon Lucid and her cosmaut colleagues, both named Yuri, her little science-fiction library, her warm Oklahoma twang and her great smile. I see that President Boris Yeltsin recently gave her the Russian Order of Friendship. Just right. Wasn't John Glenn's Mercury capsule, back there in the hostile days of 1962, named *Friendship 7*?

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SMITHSONIAN HIGHLIGHTS

# Masterpieces from Central Africa

IN THE 1870S, KING LEOPOLD II OF BELgium began implementing his dream of a colony in Africa by sending the great explorer Henry Stanley to head an expedition there on Belgium's behalf. The territory became the official Belgian colony of Congo in 1908 and an independent nation (the Democratic Republic of Congo) in 1960. To house the treasures gathered by Stanley and others, King Leopold founded what is now the Royal Museum for Central Africa. Commonly known as the Tervuren, the museum is the repository of the world's richest and most famous collection of Central African art. Thanks to an ambitious traveling exhibition, some of these masterpieces can now be seen at the National Museum of African Art. On view through October 19, "Treasures from Tervuren: Selections from the Belgian Royal Museum for Central Africa" features some of the most important works in African art history. The 125 objects in the show—masks, headrests, staffs, ancestral statues and ceremonial figures such as the Nkanu drummer shown here—provide an invaluable insight into Africa's cultural heritage. *—Diane M. Bolz*

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There was a small decrease in the clearance of cetirizine caused by a 400 mg dose of theophylline; it is possible that larger theophylline doses could have a greater effect. **Carcinogenesis, Mutagenesis and Impairment of Fertility:** No evidence of carcinogenicity was observed in a 2-year carcinogenicity study in rats at dietary doses up to 20 mg/kg/day (approximately 10 times the maximum recommended human daily oral dose on a mg/m$^2$ basis). An increased incidence of benign liver tumors was found in a 2-year carcinogenicity study in male mice at a dietary dose of 16 mg/kg/day (approximately 4 times the maximum recommended human daily oral dose on a mg/m$^2$ basis). The clinical significance of these findings during long-term use of ZYRTEC is not known. Cetirizine was not mutagenic in the Ames test, and not clastogenic in the human lymphocyte assay, the mouse lymphoma assay, and *in vivo* micronucleus test in rats. No impairment of fertility was found in a fertility and general reproductive performance study in mice at an oral dose of 64 mg/kg/day (approximately 26 times the maximum recommended adult human daily oral dose on a mg/m$^2$ basis). **Pregnancy Category B:** Cetirizine was not teratogenic in mice, rats and rabbits at oral doses up to 96, 225, and 135 mg/kg/day (or approximately 40, 180, and 215 times the maximum recommended adult human daily oral dose on a mg/m$^2$ basis), respectively. There are no adequate and well-controlled studies in pregnant women. Because animal studies are not always predictive of human response, ZYRTEC should be used in pregnancy only if clearly needed. **Nursing Mothers:** Retarded pup weight gain was found in mice during lactation when dams were given cetirizine at 96 mg/kg/day (approximately 40 times the maximum recommended adult human daily oral dose on a mg/m$^2$ basis). Studies in beagle dogs indicate that approximately 3% of the dose is excreted in milk. Cetirizine has been reported to be excreted in human breast milk. Because many drugs are excreted in human milk, use of ZYRTEC in nursing mothers is not recommended. **Geriatric Use:** In placebo-controlled trials, 186 patients aged 65 to 94 years received doses of 5 to 20 mg of ZYRTEC per day. Adverse events were similar in this group to patients under age 65. Subset analysis of efficacy in this group was not done. **Pediatric Use:** The safety of ZYRTEC, at daily doses of 5 or 10 mg, has been demonstrated in 376 pediatric patients 6-11 years of age in placebo-controlled trials lasting up to four weeks and in 254 patients in a non-placebo-controlled 12 week trial. The effectiveness of ZYRTEC for the treatment of seasonal and perennial allergic rhinitis and chronic idiopathic urticaria in this pediatric age group is based on an extrapolation of the demonstrated efficacy of ZYRTEC in adults in these conditions and the likelihood that the disease course, pathophysiology and the drug's effect are substantially similar between these two populations. The recommended doses for the pediatric population are based on a cross-study comparison of the pharmacokinetics and pharmacodynamics of cetirizine in adults and pediatric subjects and on the safety profile of cetirizine in both adults and pediatric patients at doses equal to or higher than the recommended doses. The cetirizine AUC and $C_{max}$ in pediatric subjects 6-11 years of age who received a single dose of 10 mg of cetirizine syrup was estimated to be intermediate between that observed in adults who received a single dose of 10 mg of cetirizine tablets and those who received a single dose of 20 mg of cetirizine tablets. **ADVERSE REACTIONS** Controlled and uncontrolled clinical trials conducted in the United States and Canada included more than 6000 patients aged 12 years and older, with more than 3900 receiving ZYRTEC at doses of 5 to 20 mg per day. The duration of treatment ranged from 1 week to 6 months, with a mean exposure of 30 days. Most adverse reactions reported during therapy with ZYRTEC were mild or moderate. In placebo-controlled trials, the incidence of discontinuations due to adverse reactions in patients receiving ZYRTEC 5 mg or 10 mg was not significantly different from placebo (2.9% vs. 2.4%, respectively). The most common adverse reaction in patients aged 12 years and older that occurred more frequently on ZYRTEC than placebo was somnolence. The incidence of somnolence associated with ZYRTEC was dose related, 6% in placebo, 11% at 5 mg and 14% at 10 mg. Discontinuations due to somnolence for ZYRTEC were uncommon (1.0% on ZYRTEC vs. 0.6% on placebo). Fatigue and dry mouth also appeared to be treatment-related adverse reactions. There were no differences by age, race, gender or by body weight with regard to the incidence of adverse reactions. Table 1 lists adverse experiences in patients aged 12 years and older which were reported for ZYRTEC 5 and 10 mg in controlled clinical trials in the United States and that were more common with ZYRTEC than placebo. **Table 1. Adverse Experiences Reported in Patients aged 12 years and older in Placebo-Controlled United States ZYRTEC Trials (Maximum Dose of 10 mg) at Rates of 2% or Greater (Percent Incidence), ZYRTEC (N=2034) vs Placebo (N=1612) respectively:** Somnolence (13.7% vs 6.3%); Fatigue (5.9% vs 2.6%); Dry Mouth (5.0% vs 2.3%); Pharyngitis (2.0% vs 1.9%). Dizziness (2.0% vs 1.2%). In addition, headache and nausea occurred in more than 2% of the patients, but were more common in placebo patients. Pediatric studies were also conducted with ZYRTEC. More than 1300 pediatric patients (6 to 11 years) with more than 900 treated with ZYRTEC at doses of 1.25 to 10 mg per day were included in controlled and uncontrolled clinical trials conducted in the United States. The duration of treatment ranged from 2 to 12 weeks. The majority of reported adverse reactions reported in pediatric patients (6 to 11 years) with ZYRTEC were mild or moderate. In placebo-controlled trials, the incidence of discontinuations due to adverse reactions in pediatric patients receiving up to ZYRTEC 10 mg was uncommon (0.4% on ZYRTEC vs 1.0% on placebo). Table 2 lists adverse experiences which were reported for ZYRTEC 5 and 10 mg in pediatric patients (6 to 11 years) in placebo-controlled clinical trials in the United States and were more common with ZYRTEC than placebo. Of these, abdominal pain was considered treatment-related and somnolence appeared to be dose related. 1.3% in placebo, 1.9% at 5 mg and 4.2% at 10 mg. **Table 2. Adverse Experiences Reported in Pediatric Patients (6 to 11 years) in Placebo-Controlled United States ZYRTEC Trials (5 or 10 mg dose) Which Occurred at a Frequency of ≥ 2% in Either the 5 mg or the 10 mg ZYRTEC Group, and More Frequently Than in the Placebo Group. ZYRTEC 5 mg (N=161), 10 mg (N=215) vs Placebo (N=309):** Headache (11.0%, 5 mg; 14.0%, 10 mg; 12.3%, placebo). Pharyngitis (6.2%, 5 mg; 2.8%, 10 mg; 2.9%, placebo). Abdominal pain (4.4%, 5 mg; 5.6%, 10 mg; 1.9%, placebo). Coughing (4.4%, 5 mg; 2.8%, 10 mg; 3.9%, placebo). Somnolence (1.9%, 5 mg; 4.2%, 10 mg; 1.3%, placebo). Diarrhea (3.1%, 5 mg; 1.9%, 10 mg; 1.3%, placebo). Epistaxis (3.7%, 5 mg; 1.9%, 10 mg; 2.9%, placebo). Bronchospasm (3.1%, 5 mg; 1.9%, 10 mg; 1.9%, placebo). Nausea (1.9%, 5 mg; 2.8%, 10 mg; 1.9%, placebo). Vomiting (2.5%, 5 mg; 2.3%, 10 mg; 1.0%, placebo). The following events were observed infrequently (less than 2%), in either 3982 adults and children 12 years and older or in 659 pediatric (6 to 11 years) patients who received ZYRTEC in U.S. trials, including an open adult study of six months duration; a causal relationship with ZYRTEC administration has not been established. **Autonomic Nervous System:** anorexia, urinary retention, flushing, increased salivation, dry mouth. **Cardiovascular:** palpitation, tachycardia, hypertension, cardiac failure. **Central and Peripheral Nervous Systems:** paresthesia, confusion, hyperkinesia, hypertonia, migraine, tremor, vertigo, leg cramps, ataxia, dysphonia, abnormal coordination, hyperesthesia, hypoesthesia, myelitis, paralysis, ptosis, twitching, visual field defect, syncope, dizziness. **Gastrointestinal:** increased appetite, dyspepsia, abdominal pain, diarrhea, flatulence, constipation, vomiting, ulcerative stomatitis, aggravated tooth caries, stomatitis, tongue discoloration, tongue edema, gastritis, rectal hemorrhage, hemorrhoids, melena, abnormal hepatic function, eructation. **Genitourinary:** polyuria, urinary tract infection, cystitis, dysuria, hematuria, micturition frequency, urinary incontinence. **Hearing and Vestibular:** earache, tinnitus, deafness, ototoxicity. **Metabolic/Nutritional:** thirst, dehydration, diabetes mellitus. **Musculoskeletal:** myalgia, arthralgia, arthrosis, arthritis, muscle weakness. **Psychiatric:** insomnia, sleep disorder, nervousness, depression, emotional lability, impaired concentration, anxiety, depersonalization, paroniria, abnormal thinking, agitation, amnesia, decreased libido, euphoria. **Respiratory System:** epistaxis, rhinitis, coughing, bronchospasm, dyspnea, upper respiratory tract infection, hyperventilation, sinusitis, increased sputum, bronchitis, pneumonia, respiratory disorder. **Reproductive:** dysmenorrhea, female breast pain, intermenstrual bleeding, leukorrhea, menorrhagia, vaginitis. **Reticuloendothelial:** lymphadenopathy. **Skin:** pruritus, rash, dry skin, urticaria, acne, dermatitis, erythematous rash, increased sweating, alopecia, angioedema, furunculosis, bullous eruption, eczema, hyperkeratosis, hypertrichosis, photosensitivity reaction, photosensitivity toxic reaction, maculopapular rash, seborrhea, purpura, skin disorder, skin nodule. **Special Senses:** taste perversion, taste loss, parosmia. **Vision:** blindness, loss of accommodation, eye pain, conjunctivitis, xerophthalmia, glaucoma, ocular hemorrhage. **Body as a Whole:** increased weight, back pain, malaise, fever, asthenia, generalized edema, periorbital edema, peripheral edema, rigors, leg edema, face edema, hot flashes, enlarged abdomen, nasal polyp, pain, pallor, chest pain, accidental injury. Occasional instances of transient, reversible hepatic transaminase elevations have occurred during cetirizine therapy. A single case of possible drug-induced hepatitis with significant transaminase elevation (500 to 1000 IU/L) and elevated bilirubin has been reported. In foreign marketing experience the following additional rare, but potential severe adverse events have been reported: hemolytic anemia, thrombocytopenia, orofacial dyskinesia, severe hypotension, anaphylaxis, hepatitis, glomerulonephritis, stillbirth, and cholestasis. **DRUG ABUSE AND DEPENDENCE** There is no information to indicate that abuse or dependency occurs with ZYRTEC. **OVERDOSAGE** Overdosage has been reported with ZYRTEC. In one adult patient who took 150 mg of ZYRTEC, the patient was somnolent but did not display any other clinical signs or abnormal blood chemistry or hematology results. In an 18-month-old pediatric patient who took an overdose of ZYRTEC (approximately 180 mg), restlessness and irritability were observed initially; this was followed by drowsiness. Should overdose occur, treatment should be symptomatic or supportive, taking into account any concomitantly ingested medications. There is no known specific antidote to ZYRTEC. ZYRTEC is not effectively removed by dialysis, and dialysis will be ineffective unless a dialyzable agent has been concomitantly ingested. The acute minimal lethal oral doses in mice and rats were 237 and 562 mg/kg, respectively (approximately 55 and 265 times the maximum recommended human daily oral dose on a mg/m$^2$ basis). In rodents, the target of acute toxicity was the central nervous system, and the target of multiple-dose toxicity was the liver. **DOSAGE AND ADMINISTRATION Adults and Children 12 years and older:** The recommended initial dose of ZYRTEC is 5 or 10 mg per day in adults and children 12 years and older, depending on symptom severity. Most patients in clinical trials started at 10 mg. ZYRTEC is given as a single daily dose, with or without food. The time of administration may be varied to suit individual patient needs. In patients with decreased renal function (creatinine clearance 11-31 mL/min), patients on hemodialysis (creatinine clearance less than 7 mL/min), and in hepatically impaired patients, a dose of 5 mg once daily is recommended. **Children 6 to 11 years:** The recommended initial dose of ZYRTEC in children aged 6 to 11 years is 5 or 10 mg (1 or 2 teaspoons) once daily depending on symptom severity. The time of administration may be varied to suit individual patient needs. Cetirizine is licensed from UCB Pharma, Inc.

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SMITHSONIAN HIGHLIGHTS

## "America's Smithsonian"

**SAN JOSE CONVENTION CENTER**
**SAN JOSE, CALIFORNIA**

(THROUGH August 31) The traveling exhibition of Smithsonian treasures continues its tour. *Note*: Admission is free, but passes are required. Advance passes are available for a service fee of $3.50 each by calling 1-800-913-TOUR.

## Special August Exhibitions, Events

### ART NIGHT ON THE MALL

The International Gallery, and the Freer, Sackler, Hirshhorn and African Art museums are open Thursday evenings until 8 P.M., through August 28.

### SMITHSONIAN JAZZ

The Smithsonian Jazz Masterworks Orchestra offers concerts in Washington, D.C., August 16-17. Admission is free, but tickets are required. For details call 202-357-4574.

## Planning a Smithsonian Visit?

Receive a free Associates' planning packet. Write Smithsonian Information, Smithsonian Institution, Washington, D.C. 20560, or call 202-357-2700 (voice) or 202-357-1729 (TTY), 9 A.M. - 5 P.M., Monday-Friday; 10 A.M. - 4 P.M., Saturday-Sunday. *Note:* Parking near the Smithsonian is limited. The Metrorail subway is convenient to all museums (details in packet).

Begin your visit at the Smithsonian Information Center's Associates' Reception Desk—open 9 A.M. - 4 P.M. daily—in the Castle. Special materials await you there. The Court dining room and all other eating facilities in the National Museum of Natural History are now closed. Associates may receive a discount on table service at the National Air and Space Museum's Wright Place restaurant, open 11:30 A.M. - 3 P.M.

Smithsonian museums are generally open 10 A.M. - 5:30 P.M. daily, except December 25. Hours at the National Zoo are 10 A.M. - 6 P.M. daily for buildings, 6 A.M. - 8 P.M. for grounds.

**SMITHSONIAN WEBSITE**

For on-line information about exhibitions, collections, events and products: www.si.edu

### NATIONAL MUSEUM OF AFRICAN ART

*Treasures from Tervuren: Selections from the Belgian Royal Museum for Central Africa* (through October 19) Exhibition showcases masterpieces from the world's greatest collection of Central African art. (See page 26.)

### FREER GALLERY OF ART

*The Evolution of Chinese Celadon* (opens August 2) Exhibition of Chinese ceramics examines the development of the gray-green glaze known as celadon. *Art for Art's Sake* (opens August 9) American art assembled by the gallery's founder, Charles Lang Freer.

### ARTHUR M. SACKLER GALLERY

*King of the World: A Mughal Manuscript from the Royal Library, Windsor Castle* (through October 13) Paintings from the *Padshahnama*, a 17th-century imperial manuscript from India, chronicle the first decade of the reign of Shah-Jahan, builder of the Taj Mahal. (See page 56.)

### HIRSHHORN MUSEUM & SCULPTURE GARDEN

*The Hirshhorn Collects: Recent Acquisitions, 1992-1996* (through September 7) Exhibition features works by Jean Dubuffet, Claes Oldenburg, Felix Gonzalez-Torres and Andy Warhol.

### INTERNATIONAL GALLERY, S. DILLON RIPLEY CENTER

*American Voices: Latino Photographers in the United States* (through September 28) Photographs and artworks from the 1930s to the 1990s highlight the work of top Latino artists from around the country.

### NATIONAL MUSEUM OF AMERICAN HISTORY

*American Families in Photographs* (through September 1) Photographs from the Smithsonian's permanent collections reflect both the continuity and the change in American family life in the past 150 years.

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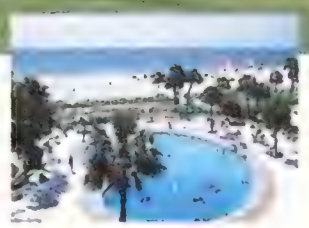

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# RUSSIAN COLLECTION

Dept. 184 Rte 16A, RR1 Box 5, Intervale, NH 03845 Phone 603 356 7832

*The Family Car* (through September 1) Exhibition explores how American families have used and enjoyed cars over the years. Highlights include a 1928 Gilkie tent trailer, a 1972 Volkswagen and a 1955 Ford station wagon.

### NATIONAL POSTAL MUSEUM
[NEAR UNION STATION ON CAPITOL HILL]

*Fakes and Forgeries* (through September 11) Exhibition of counterfeit or forged philatelic items.

### NATIONAL AIR AND SPACE MUSEUM

*Space Race* New permanent exhibition traces the competition in space between the United States and the former Soviet Union back to its origins in the 1950s. (See *Around the Mall*, page 22.)
*Women and Flight* (through September 12) Images of contemporary women aviators by NASM photographer Carolyn Russo.

### NATIONAL MUSEUM OF NATURAL HISTORY

*Amber: Window to the Past* (through September 1) Exhibition organized by the American Museum of Natural History in New York examines the scientific and artistic significance of nature's "organic jewel." *Note:* Tickets are required for admission; call (202) 357-4577.
*HoloGlobe* (through September 1) First public showing of large-scale High-Definition Volumetric Display (HDVD) offers a unique look at our planet.

### NATIONAL ZOOLOGICAL PARK

*Amazonia Science Gallery* New permanent exhibition looks at the work of Smithsonian biologists worldwide.

### NATIONAL PORTRAIT GALLERY

*Image of the President: Photographs by George Tames, 1944-1974* (through September 1) Works by the Pulitzer Prize-winning *New York Times* photographer document the American Presidency.
*Breaking Racial Barriers: African Americans in the Harmon Foundation Collection* (through September 14) Portraits from the 1950s exhibition "Portraits of Outstanding Americans of Negro Origin."

This 1956 photograph of newlyweds being showered with rice is in the "American Families in Photographs" exhibition at the Museum of American History.

### NATIONAL MUSEUM OF AMERICAN ART

*David Hockney's 'Snails Space': Painting as Performance* (through September 14) Installation features a double-canvas painting and accompanying floor piece illuminated by a computerized sequence of colored lights.

### RENWICK GALLERY

*Reinstallation of the Permanent Collection* The Renwick's 25th anniversary is celebrated with works by prominent craft artists.

### ARTS AND INDUSTRIES BUILDING

*Caribbean Visions: Contemporary Painting and Sculpture* (August 15-October 4) Some 100 works by 56 painters and sculptors illustrate creativity in the Caribbean during the past 50 years.
**Discovery Theater** Live theater for young audiences. For information, show times, ticket prices and reservations, call (202) 357-1500 (voice or TTY) weekdays, 9 A.M. - 4 P.M.

### THE CASTLE—INFORMATION CENTER

*Smithson's Gift* Permanent display tells the story of the British scientist whose bequest founded the Smithsonian.

### ANACOSTIA MUSEUM

*Museum Closed* Reopens fall of 1997.

### HEYE CENTER, NATIONAL MUSEUM OF THE AMERICAN INDIAN [NEW YORK CITY]

*Agayuliyararput (Our Way of Making Prayer): The Living Tradition of Yup'ik Masks* (through August 17) More than 200 masks created by Yup'ik Eskimos.

### COOPER-HEWITT, NATIONAL DESIGN MUSEUM [NEW YORK CITY]

*The Jewelry of Tone Vigeland* (through August 24) Exhibition of the unique designs of the Norwegian jeweler.
*Henry Dreyfuss: Directing Design* (through August 31) Prototypes and products by Dreyfuss and his firm.

### SMITHSONIAN PRODUCTIONS

*Labor Day Weekend Radio* "Guitar: Electrified, Amplified, and Deified": radio special with Grammy Award-winner Pat Metheny, bluesman Joe Louis Walker and country guitarist Junior Brown celebrates the invention of the electric guitar. Check local public radio listings.

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PARK AVENUE BY BUICK
THE POWER OF UNDERSTATEMENT

Jim Thompson steers while his wife, Jan, turns for another look at their flooded home in Arboga, California.

# Water Water Every where

BY EDWIN KIESTER, JR.

THREE SEVERE STORMS IN A WEEK DRENCHED NORTHERN CALIFORNIA LAST WINTER. FORECASTS OF RAINFALL AND RIVER LEVELS WERE GOOD ENOUGH TO KEEP LOSS OF LIFE AND PROPERTY DAMAGE TO A MINIMUM

*"We see a hell of a lot of rain over the next eight days"—more than 20 inches in places.*

As he switched off the tree lights on Christmas night, Bill Mork headed for bed with a sense of foreboding. After five straight days of closely monitoring a snowstorm that dumped up to nine feet of snow in the Sierra Nevada, the California state meteorologist was taking a few days off. After all, his weather forecast on December 23 had shown uneventful weather right through New Year's Day. Now, two days later, television weathermen were predicting a wet weekend and storms deluging Northern California perhaps for a week.

The next morning, seated before his computer in the joint state-federal Flood Operations Center in Sacramento, Mork could see that the outlook had indeed dramatically changed. A high-pressure area centered over Alaska had caused a low-pressure area to form in the eastern North Pacific, which pulled moisture-laden subtropical air northeastward, directly toward Northern California. It was already raining, and a formidable storm, which he estimated would hit on the weekend, was approaching the coast. A second strong storm was following in its wake. Little did he know that by the 28th, a third storm would be seen lurking in the Western Pacific with ominously greater wallop.

Reviewing weather charts and computer models the next day, the 27th, Mork grew confident that the potential third storm, carrying the remnants of a Philippine typhoon, would smash into California along with the New Year. Seeking more evidence, he consulted global forecasts of the European Centre for Medium-Range Weather Forecasts in England and the British Meteorological Office. He reviewed images from U.S. and Japanese satellites. Then he looked up weather records from California's great storms of 1964 and 1986.

Mork had been forecasting California weather for 14 years, and amid the curves and circles and squiggly lines and tiny notations on the weather charts, he saw an ominously familiar pattern. The combination of a blocking high-pressure area over Alaska and a strong, warm flow from the tropics "had parallels to our historic storms of the century." California was facing a disaster.

When "disaster" and "California" appear in the same sentence, most people think of a nervous Earth shaking buildings and bridges, or out-of-control wildfires roaring through the hills. In fact, year in and year out, nine out of ten natural disasters in the state result from floods. Historians still write with awe of 19th-century floods that turned central California into an inland sea, and of monster floods in 1955, 1964 and 1986 that cost dozens of lives and billions of dollars. Lesser floods are more frequent.

Disastrous floods, of course, are by no means peculiar to California. Floods this year in Ohio, Kentucky and North Dakota, and the 1993 inundations along the Missouri and Mississippi rivers caused tremendous destruction as well as loss of life. According to the National Weather Service (NWS), floods in the United States result in more property damage and loss of life than any other natural event. The toll in Grand Forks and along the Red River is still being tabulated. There are communities along the Mississippi and the Missouri that still have not completely recovered from 1993.

Humans have been trying to predict riverine temper tantrums since the days of the pharaohs. Eyeball and finger-in-the-wind methods came first, eventually giving way to more sophisticated rain gauges, measuring devices in streams and volunteer observers who phoned their data to a central forecasting headquarters. Today the NWS keeps a weather eye on rivers via 13 high-tech river forecast centers, the largest of them—the California-Nevada River Forecast Center—in partnership with the state of California.

At each center, a corps of meteorologists, hydrologists, water management experts and hydraulic engineers charts every water movement to forecast when, and how emphatically, rivers might rise. Forecasters receive a constant stream of data from automated rain gauges, U.S. Geological Survey (USGS) and California Department of Water Resources (DWR) measuring stations in rivers and streams, and satellite pictures, and use Doppler radar to track storms. They plug the numbers into computer models that analyze every drop of water, degree of temperature and millibar of atmospheric pressure. They consult their own experience and horse sense. With all this, they have eliminated much of the guesswork from flood forecasting. And yet, acknowledges Maurice Roos, California's veteran chief hydrologist, flood forecasting remains an inexact science.

A nondescript office building on the edge of Sacramento houses under one roof the NWS California-Nevada River Forecast Center; the NWS Sacramento Weather Office; the hydrology branch of the DWR; the U.S. Bureau of Reclamation Central Valley Project; and the State Water Project operators, all concerned with the waters' rise and fall. On that wet Friday, December 27, representatives from 20 agencies crowded into the Flood Operations Center to hear Mork's morning weather briefing. Displaying computer models, maps and rainfall figures, he told the group to brace for a one-two-three punch. The first storm would hit Sunday and produce four inches of precipitation; the second, on Monday, would add four inches more, with the third storm bringing rain through New Year's Day.

"We see a hell of a lot of rain over the next eight days," Mork said—more than 20 inches in the Feather River basin

PP. 34-35, LACY ATKINS/AP WIDE WORLD PHOTOS

While visiting Guerneville, near the flooding Russian River, Mike Reilly and his son Jacob carry their raft—just in case—during a stroll through downtown in search of coffee.

by January 2. It would follow the storm track that the media nicknamed the "Pineapple Express" because of its supposed Hawaiian origin. Temperatures would be well above freezing at elevations up to 9,000 feet, so virtually all the "precip" would fall as rain, not snow, and quickly run off—bad news when some parts of the state had already received more than two and a half times the normal precipitation for the month. Knowing that alarming the state with an inaccurate forecast could cost millions in unnecessary flood-fight mobilization, Mork nonetheless stuck with his prediction. The weather conditions were almost exactly like those that had produced the record-breaking floods of 1964 and 1986.

A call from the Flood Operations Center soon went out to Sacramento's riverside Discovery Park, where officials began to close the parking lot and turn away tourists. Then hydrologists at the center went to work. One task was to estimate the amount of water in the rivers up to 120 hours in the future—"not just how much and where," state hydrologist Gary Hester was to say, "but when." Into their computer model went the amount of rain that had fallen, the forecast of how much would fall, the route the runoff was likely to take, the measured river and reservoir inflows, and the present saturation of the ground in the watershed. Those figures were combined with measurements of current water levels at some 40 USGS stations, among others.

"The earth is like a wet kitchen sponge," says Frank Richards of the NWS Hydrologic Information Center in Silver Spring, Maryland. "The sponge can only absorb so much water and then the water rolls right off onto the floor." That certainly described Northern California on December 27. Most watersheds were sopping from storms on the previous weekend as well as earlier ones. Runoff in some areas could start virtually with the very first raindrop. It would arrive in streams that were already swollen. Additionally, a heavy snowpack, up to 11 feet, lay in the mountains. High-altitude rain and warm temperatures would mostly compact the snow rather than melt it, the model showed, but runoff from melting would be equivalent to runoff from as much as 10 percent additional precipitation.

California uses three stages of flood alerts. At the "warning" stage, patrols of levees begin and warnings go out that low-lying roads and land may be flooded. "Flood" stage for

unleveed rivers indicates that there will be considerable inundation of land—the point when precautions should be taken to protect lives and property. For leveed rivers, flood stage occurs when levees reach their full capacity. A foot higher than this and the leveed water reaches the "danger" stage, at which damage to life and property is imminent. On December 27, the forecast center issued its first bulletin of this flood. The Sacramento River had risen to warning levels, or nearly so, at four places that morning.

**The Sacramento and San Joaquin rivers and their major tributaries, where the most rain and flooding occurred, are shown on this map of a large portion of California. The two major rivers are the "spine" of the Central Valley.**

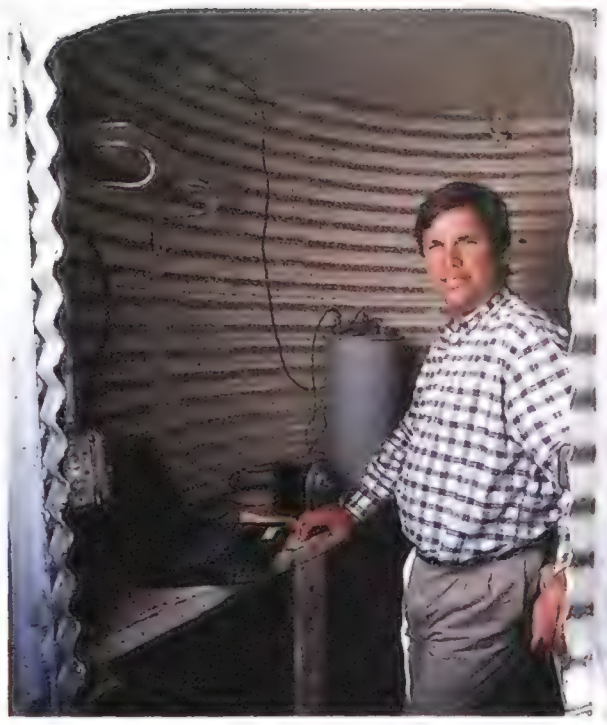
Some California rivers pour westward into the Pacific; others head eastward into the Nevada desert. But just over half of Northern California's precipitation funnels into the Central Valley, the huge basin extending from Shasta Dam in the north to Bakersfield in the south. The south-flowing Sacramento River, the state's largest, with its six major tributaries, and the smaller, north-flowing San Joaquin, with its own chain of mountain-fed streams, make possible the state's huge irrigated agribusiness, as well as provide water for the faucets and swimming pools of arid Southern California. Precipitation falls almost exclusively between November and April, so each raindrop and snowflake is precious and must be carefully hoarded to survive six months of dry spells.

California's water supply is thus bottled up by more than 1,400 dams and reservoirs. Five thousand miles of earthen levees, some 100 years old, imprison the often unruly rivers within their channels. Weirs and bypasses serve as flood-pressure relief valves, detouring winter waters into floodplains that become farmlands during the dry season.

Each major reservoir reserves a portion of its capacity for flood prevention. Of the 4.5 million acre-feet of storage space behind Shasta Dam, for example, 1.3 million is set aside to accommodate floodwaters. (One acre-foot is the amount of water that will cover one acre to a depth of one foot, or about 325,000 gallons.) Saving space for a wet January while husbanding enough for a dry August thus becomes an elaborate yearly minuet. "You don't want to release water too soon on the basis of a flood forecast that might not come true," says Roos. "Because once you let it go, you can never get it back." But reservoir operators don't want to be overwhelmed, either. River forecasters tell operators how much runoff to expect; operators decide how to make way for it; and forecasters predict downstream water levels—and issue flood warnings.

On Sunday, December 29, Bill Mork woke to a weatherman's nightmare. For two days his confident predictions of forthcoming downpours had been all over the airwaves. But now, in the Sacramento Valley, only a few soft sprinkles were falling. On the phone, a fellow church choir member needled him: "What happened to that big storm you were talking about?" Mork ruefully agreed that the quarter-inch of precipitation was "underwhelming." Nearly 100 flood and emergency officials attended his morning briefing. Some of his listeners were skeptical, and a few were downright hostile.

Paul Fujitani knew bet-



When the storms forecast by Bill Mork (above, at the Flood Operations Center) hit, Mark Heggli (above, right) monitored their progress with data from stream gauge stations like this one, as Chet Bowling (right, at Folsom Dam) juggled inflows and releases.

ter. One floor above the Flood Operations Center, Fujitani and fellow hydraulic engineers at the U.S. Bureau of Reclamation controlled five major dams and reservoirs on the Sacramento and San Joaquin rivers and their tributaries. Computerized models reaching Sacramento disclosed that, in the next few days, rain would fall by the bucketful above Shasta Dam, on the Sacramento River's northern reaches. Water would gush into the reservoir at what would become a record rate on January 1.

Fujitani's boss, Chet Bowling, knew better, too. Only a few days before, Bowling was driving north to Oregon for his wife's grandmother's 100th birthday celebration when he ran into downpours far heavier than the forecast had anticipated. Bowling immediately stopped and phoned Reclamation headquarters. Shasta Lake was already a bit swollen from the previous weekend's storms, and the bureau had begun releasing water to make room for the coming inflows. Bowling authorized increased releases ahead of the massive inflow of water. The releases had to be carefully calibrated, however, because tributaries below the dam were also pouring record amounts into the river.

The 1993 floods on the Mississippi and the Missouri took days and even weeks to ceremoniously build to a crescendo, allowing downstream communities to prepare themselves for the onslaught. The Red River flooding, fed by rapid melting of unprecedented snowfall, spread gradually over the tabletop-flat North Dakota landscape. But "gravity is the big player in California," Frank Richards says. Because of steep, mountainous terrain, in a mere 12 hours water released from Shasta Dam reaches Red Bluff, a major farm center about 700 feet lower and about 40 miles away. Water from the highest and rainiest parts of the Feather River watershed arrives in Sacramento in three days. Thus, on the morning of Sunday, December 29, the hydrology team at the forecast center announced that the Sacramento was already flooding at one place and had reached the warning stage at eight others.

The Sacramento had also climbed to 25 feet at the I Street Bridge in the heart of the state capital. That figure automatically summoned the Flood Operations Center to round-the-clock operation. DWR employees were mobilized to notify emergency officials and answer phone calls from worried citizens. Twenty-four-hour patrols began to watch for problems in the levees. The National Guard and prison inmates stood by for sandbagging and rescue duty.

California's dams and reservoirs are operated by a network of federal, state and local agencies, plus power companies, irrigation districts and water agencies. For example, just the Stanislaus River, a major San Joaquin tributary, is dammed in more than ten places. Each reservoir's inflow and outflow affects that of the others downstream, necessitating an intricate process of cooperation, and sometimes balky coordination, spelled out for some of the most critical Central Valley dams and reservoirs by the U.S. Army Corps of Engineers.

On Tuesday, December 31, the forecast center gave more bad news. "Heavy rain has produced a major flood on the upper Sacramento River," declared the 9 A.M. bulletin. The

Workers fill sandbags to block a "boil" where water is leaking through a levee on Tyler Island near Isleton. They are members of the California Conservation Corps.

river was already almost a foot above the 23-foot flood stage at Red Bluff. The lower Sacramento and the Feather had each reached the warning stage in three places, and some smaller creeks were already out of their banks. Warnings had been sounded at eight places in the San Joaquin basin.

At his morning briefing, Mork could offer no respite. An overflow crowd heard a prediction of continued intense rain for the next day and a half. With the second storm continuing and the third looming just off the coast, some mountain locations had already collected a foot and a half of rain. Crews were frantically sandbagging at dozens of levees. The river models indicated that three major reservoirs might fill to the brim before the rain stopped. Chet Bowling told Shasta crews to place flashboards on top of the emergency spill gates, which would add two feet of height and hold about 60,000 more acre-feet of water.

California's rivers respond quickly to rain, so flood warnings use both observations and predictions of rainfall. In addition to rain gauges, one observational tool is Doppler radar, which tracks storms, showing heavy downpours and lighter ones in vivid colors. For prediction, California forecasters rely on NWS data as well as an ingenious computer model developed by Owen Rhea of the Sacramento NWS staff. His orographic model forecasts precipitation produced by air lifted over mountains. In it, predictions of wind, temperature and humidity up to 20,000 feet are combined with land-elevation data at three-mile intervals to pinpoint precipitation amounts and locations in the mountains. Such a tool is invaluable, as most precipitation in the Central Valley watershed falls in the mountains above the valley.

What the orographic model showed on December 31 was awesome. Ordinarily, three times as much precipitation falls in the mountains as in the Sacramento Valley. But throughout the three storms the mountains were *eight* times wetter. And with a temperature of 37 degrees Fahrenheit even at 9,000 feet, most precipitation was falling as rain and running off immediately in torrential amounts. Forecasters saw with a shudder that water would cascade down the Feather into Lake Oroville at more than 250,000 cubic feet per second (cfs)—nearly as much as the rate of the great storm of 1986. (One cubic foot is about 7.5 gallons.)

When 1997 arrived at midnight, none of the weary forecast crews felt like toasting it. Mork's third storm was delivering as promised—and then some. Mork himself drove to the center at 5 A.M. January 1. Windshield wipers could hardly keep up with the deluge; his car swerved and hydroplaned as water streamed across the highway. Mork had predicted that 6.2 inches of precipitation would fall on the Feather River basin between 4 A.M. January 1 and 4 A.M. January 2. He wondered now if he might be wrong—on the low side.

BRYAN PATRICK/SACRAMENTO BEE

Water from the Cosumnes River surges through a break in a levee near Wilton, California. It will cost $500,000 to repair the levee; damage to the sod field totaled $1.7 million.

At the Flood Operations Center, Mark Heggli gazed at his computer screen with gratification and awe. Although other forecast centers depend more on volunteer weather observers, nearly all of California's data collection is automated. Heggli, a DWR meteorologist, supervised collection of data from more than 200 real-time hydrometeorological data stations in remote and rugged locations, some of which have tiny tipping buckets capturing each raindrop and sending back a signal when filled. This information was combined with the USGS data on how much water was already in the streams and rivers.

Heggli watched, fascinated by the data coming in: a bright blue line of steeply ascending dots representing rainfall. The station at La Porte, at a 5,000-foot elevation on the south fork of the Feather River, registered 6 inches of rain by 11 A.M. in a downpour that would eventually reach 11 inches for the day. Heggli switched to Bucks Lake, a notoriously wet spot where the mountain range makes a sharp turn to the west. Bucks Lake was on its way to 11 inches for the day and a whopping 42 inches for all the storms.

"Very heavy rain is producing a major flood on the upper Sacramento," an early New Year's morning forecast warned. The river was expected to rise as much as three feet above flood stage at Red Bluff and seven feet above flood stage downstream and to remain at such heights through Thursday. Farther south, a "major rise" was occurring. The leveed Feather was expected to reach flood stage at Nicolaus, 30 miles above Sacramento, and was threatening the twin towns of Yuba City and Marysville. Rivers in the San Joaquin basin had reached flood stage in three places and were at the warning stage in five others.

And still the rains came—and came.

"We were really sweating," Mork recalled later. "The inflows were exceeding anything seen this century. It scared the hell out of people. You see all this coming in and you say, 'When is it ever going to stop?'"

The Bureau of Reclamation engineers were particularly nervous. Despite the record amounts of water pouring into the Shasta reservoir, they had held back on releases to compensate for the uncontrolled flash flooding from creeks downstream. Earlier forecasts had predicted that water would pour into Shasta at a rate of more than 230,000 cfs, enough to fill the reservoir and have water released over the emergency spill gates. The inflow was already beyond 200,000 cfs, and the reservoir was rapidly losing precious storage space. "That was a situation you didn't want to be in," Bowling said, caught between making potentially damaging releases and a possibly greater disaster—losing control of releases altogether because storage space was gone.

As did Sutter County, Yuba County—with Oroville Dam

Yuba City refugees Raeven Hunt, 2, who was due for heart surgery, and her mother, Ericka, wait out the flood with other relatives for several days in Sutter High School.

forecast to overflow and water-soaked levees along the river being pounded mercilessly—suggested people leave. Fifty thousand residents of Yuba City and Marysville were urged to head for shelters and higher ground. "For miles," as one resident later described the scene, "all it was was headlights and taillights." (In the end, the river subsided and inflows fell short of the dam top, though some levees did break.)

"We can't take another eight hours of this," Paul Fujitani remembers thinking. Then, at about 4 P.M. on New Year's afternoon, the gauges at the northern end of the Shasta watershed brought the first bit of heartening news. Rainfall, while still heavy, had definitely slackened. The orographic model and the Doppler radar showed the storm moving south and east, out of the Sacramento watershed. About 24 hours later, Shasta Dam plateaued short of overflowing its emergency spill gates.

Crews in the Flood Operations Center breathed a sigh of relief—momentarily. The Sacramento floodwaters were still rolling downstream and not expected to peak for at least 24 hours. And the storm was now bearing down with full force on the San Joaquin basin.

The San Joaquin waters some of California's richest farmland. Four major tributaries and several smaller ones flow out of the southern Sierra Nevada. In winter the San Joaquin rarely floods because most precipitation falls as snow, which melts gradually in the sunshine of spring and early summer. "When it's solid, we don't worry about it," Roos had said. But this time all the precipitation below 10,000 feet fell as rain. Turbulent, record-breaking amounts of water hammered down the steep mountainsides.

Ordinarily, the Sacramento has a mean flow of 35,000 cfs. The flow on the sinuous, slow-moving San Joaquin is about a tenth of that. Its level is often higher than the land beyond its levees. The combination of storms overwhelmed the narrow channel. The Cosumnes River, unregulated by dams, alone was dumping more than 40,000 cfs into the main channel. Below Michigan Bar, a gauging site, the Cosumnes was lapping at the doors of the firehouse in tiny Wilton.

"No one had ever seen water like that," Roos said. "The river can't tolerate that kind of inflow." "Heavy rainfall is producing a major rise on the Cosumnes River," a bulletin announced at 8:15 P.M. Wednesday, forecasting an increase to near 18 feet—6 feet above flood stage—by Thursday afternoon. The next morning's bulletin upped the forecast to 19 feet. An afternoon bulletin repeated the Cosumnes forecast and reported "major flooding" on two other rivers, the Tuolumne near Modesto and the lower San Joaquin.

At 1 A.M. Friday, Roos, who had gone home for a few hours' sleep, was awakened by a call from the forecast center, asking him for advice on an emergency bulletin warning of a "significant and dangerous rise on the San Joaquin and its tributaries." "Major flooding can be expected along the

BRANT WARD/SAN FRANCISCO CHRONICLE

On New Year's Day, Ora Bauer, 10, rests as her sister Nichole, left, and mother, Joy Garcia, clean the street in front of their house on Castro Street in Martinez, near San Francisco.

Tuolumne and Merced rivers," the bulletin continued. By then in Modesto, a fast-growing city of 180,000, police were going from residence to residence, urging people to flee before the Tuolumne began to swirl into riverside trailer parks and tract houses. The Merced had come up rapidly during the night in Yosemite National Park and transformed the spectacular valley into one vast lake. Water as much as five feet deep washed through first-floor rooms of the Yosemite Lodge. Bridges were ripped out and roads undermined. Picnic tables floated downstream.

Chris Kiriakou remembers that horrific afternoon well. The assistant general manager of the Turlock Irrigation District had responsibility for Don Pedro Dam on the Tuolumne. The dam holds two million acre-feet of water and in its 26-year history had never completely filled. January 3, 1997, was different. "None of us had ever seen runoffs like we experienced that day," Kiriakou says. "They were astronomical, way beyond the capacity of the channel." Kiriakou's problems were complicated by record unchecked inflows from creeks below the dam, plus heavy releases from overloaded dams upstream. "There were heavy flows from Hetch Hetchy," he said, naming the reservoir that provides much of San Francisco's water supply. Kiriakou opened the emergency spillway and release gates for the first time since the dam was built to get rid of water virtually as fast as it came in. "We were getting inflows at 122,000 cfs. We buffered as much as we could, about 60,000 cfs, but we were still putting 59,000 cfs into a 9,000-cfs channel. I felt very badly for the people downstream [in Modesto]," he said. "It was tragic for them. But it would have been many times worse if the dam had failed and brought the whole reservoir crashing down on them."

At the Bureau of Reclamation's Friant Dam on the upper San Joaquin, operators lowered by 10 feet the dam's 18-foot drum gates. The gates are normally raised to create extra storage space. But with overflows from smaller dams upstream, operators lowered the gates to release water from the full reservoir. The outgoing flows disabled a power plant, washed out a river fish hatchery, and flooded a trailer park near Fresno.

Up and down the waterlogged Central Valley, levees were giving way, inundating homes and fields. A 1,000-foot-wide breach flooded several small towns, claimed three lives and damaged 1,200 homes and more than 300 businesses. On the middle Sacramento, a circle of sandbagged berms saved the town of Meridian, but about 35,000 acres of farmland were flooded. Levees on the San Joaquin had ruptured in more than 30 places. The levee failures conferred a kind of mixed blessing; each time a breach opened, the water level in the main channel dropped and spared downstream communities. That, of course, was small consolation to those whose property was flooded.

Angela Richebacher dries out her belongings, including the stuffed monkey in the tree. She had lived in the house behind her for exactly one day when the waters rose.

It would be three days into the New Year, with the San Joaquin's tributaries still pouring huge flows into the main channel, before the radiotelemetry, the satellite messages, the inflow gauges, the USGS measurements, Rhea's orographic model and all the rest of the technology told the forecasters that the worst of the New Year's floods was over. The combination of storms had produced an average of 25 inches of rainfall across the Feather River watershed. Many rivers and reservoirs had reached record levels. Eight persons had died, nearly 300 square miles of farmland had been inundated, and an estimated 32,000 homes and businesses had been damaged or destroyed; total damages were calculated at nearly $2 billion. Yosemite National Park was closed for almost two months for repairs.

In the wake of the floods, California began to look at new ideas for dealing with floods. Climatologists urged that the state take a closer and more global look at its long-term cycle of flood and drought. Jeffrey Mount, professor of geology at the University of California at Davis and author of *California Rivers and Streams*, publicly advocated allowing rivers to reconnect with their floodplains as a method of flood management and restricting development on flood-prone areas. Governor Pete Wilson called for increased expenditures to combat flooding and aid forecasting, including—to Mark Heggli's delight—additional telemetry for river gauges.

For the harried forecasters, flood-fighters and water management operators, it was two weeks' work to be proud of. While the timing of the rainfall occasionally eluded forecasters, the total amount forecast for the three storms was exceptionally close to what actually fell. The hydrologists came up with mostly accurate predictions not only of amounts but of timing and locations. Bowling's staff's juggling of inflows and releases had been, in Hester's words, "phenomenal" in sparing the Sacramento River and the region around it a lot more damage. The Corps of Engineers' management of reservoir flood-control space saved countless dollars of flood damage, especially in the San Joaquin Valley. Although the floods had overwhelmed or swept out several critical USGS stations, the high-tech data network had held up beautifully.

On Sunday, January 5, with the waters receding and the computer models showing dry days and clear skies ahead, Bill Mork went to church. There he met the choir member who had been so skeptical only a week before. "Well, Margaret," he said, "was that enough for you?" Sheepishly, the woman apologized for doubting him. "But please, Bill," she said, "let's don't do it again."

*Edwin Kiester, Jr., watched the waters rise last December and January from a ski cabin in the Sierra Nevada.*

BRYAN PATRICK SACRAMENTO BEE

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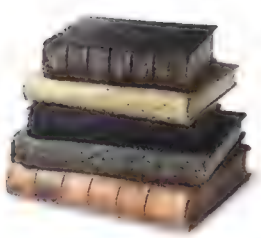

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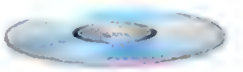

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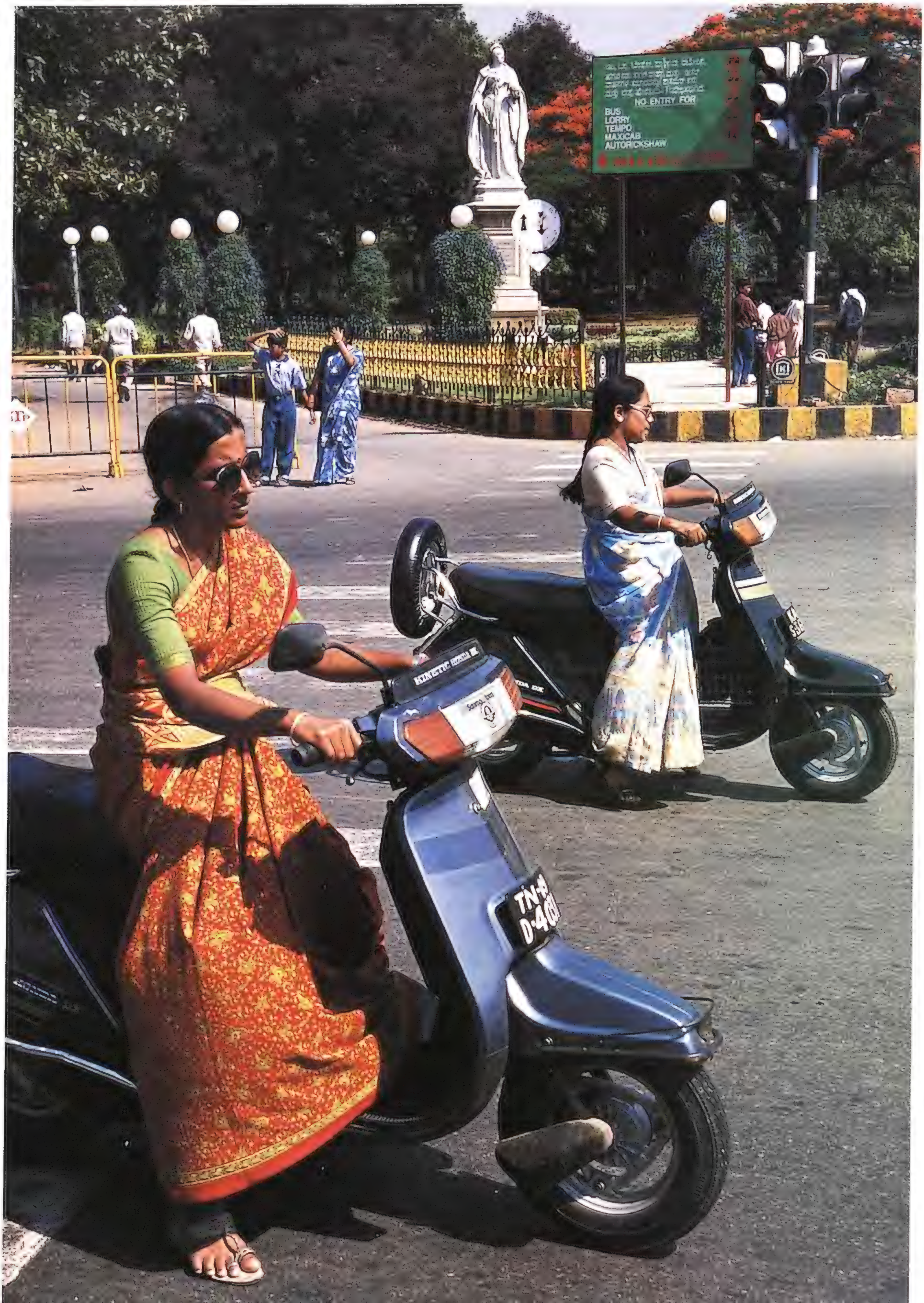
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# The Legacy

## An Englishman Looks at India Fifty Years After British Rule

BY SIMON WINCHESTER

PHOTOGRAPHS BY RAGHU RAI

Anywhere else in India the cry "*Ram! Ram!*" is as old as creation: someone is invoking the familiar name of a Hindu deity, and is using it to hail a friend.

But that's not what it means in Bangalore these days.

For this southern city of five million souls—capital of the state of Karnataka, and home of India's last prime minister—is modern India's pride and joy: a high-technology showcase for all that is good and forward-looking about the India of the new millennium. And so in Bangalore they say that anyone who shouts "*Ram!*" is less likely to be invoking an incarnation of Vishnu than performing the more mercenary '90s task of trying to hawk computer memory.

This, after all, is the city of high-tech heresies, which put itself defiantly on the map last year by staging the Miss World contest and beaming pictures of the assembled beauties around the world by satellite, to technical—if not culturally critical—acclaim. Bangalore is a city that tends to regard itself as the one place in India where an urgent digital future is taking over from widespread and accepted poverty, and the complacent Hindu fixations upon karma and dharma, and where the gods of capital and commerce are displacing the devils of caste and communalism.

These days foreigners are pouring into what is billed as one of the most go-ahead cities in South Asia, a hard-driving, satellite-uplinked, Intel-inside-everything, beer-drinking regional capital—the place where Rupert Murdoch could well site his new broadcasting headquarters if his current base in Hong Kong "goes bad." With the birth of revitalized Bangalore, everyone seems caught up in the idea that India has at last managed to get itself what China and Malaysia and Korea and other near neighbors have already acquired—a city of tomorrow.

Except that even here, uniquely, tomorrow cannot quite seem to shrug

Beneath Queen Victoria's marble gaze, women driving Indian-made motor scooters pause on Bangalore's Mahatma Gandhi Road. Above: Proud soldiers in parade dress are part of Britain's finest legacy—a resolutely nonpolitical army.

off the bonds of a hundred thousand yesterdays. History and habit still lie on Bangalore like a blanket, suffocating and preserving it all at the same time. And much of that history, inevitably, is British, and imperial.

Like it or not, in an Indian city such as Bangalore—as well as in Calcutta and what are now called Mumbai and Chennai, which until recently were known as Bombay and Madras—much of the visible history is still British. Of course, as any tourist knows who has been to India, there are Mughal palaces and Hindu temples and Rajput forts dotted all around the country. But in the great cities, the grandest of the old public buildings are all invariably British—testament to a hundred years and more during which faraway Britain ran India (SMITHSONIAN, January 1988) before releasing it from colonial control only half a century ago.

Britons refer to the curious combination, whereby so much of British structure and psyche has been so seamlessly grafted onto India, as "the legacy." Indians, also recognizing it only too well, prefer to refer to it, with some reserve, as "the inheritance." Britons tend to think of what they left behind as something rather grand and useful that has helped India to hang on to a measure of democracy, justice, good order. They like to say that Englishmen came to an India in which the people had little except poverty and the anarchy left over from India's previous masters, the Mughal emperors; and when they left, it had legislative assemblies, courts, bureaucracies, railways, roads, telephones—as well as the unifying marvel of the English language. Could the Indians possibly be anything but humbly thankful?

Well, yes, it turns out, they could, as I discovered on a recent trip to take an Englishman's look into such matters. Fifty years on, most Indians know that they were indeed gifted something by the British—but remain less than sure

*Bangalore is a city where the past and present mingle—and contrast—with an intensity shared in few other places in the Republic of India.*

of exactly how grand and useful it really was. Maybe, some think, it has actually done harm. Language, for instance. Britons regard it as a great gift, and a useful tool for India and indeed for all the colonized world beyond (America included). So far as India was concerned, English was introduced for reasons of severe practicality: to provide a common tongue for administration and learning in a country ill served by having so many mutually incomprehensible languages—no fewer than 17 of them formally regarded as official, scores of others spoken in more remote areas. So English helped provide linguistic unity to an India that, with some justice, Britons saw as dangerously divided. All to the good, surely.

When I tested this view on a former Indian Navy officer, Capt. Subbarao Prabhala, however, I got a surprise. Prabhala runs a successful electronics company and sees himself as very much a part of the new Bangalore. I went to him precisely because he seemed to be a man who not only understood technology but was impressed with all the esthetically pleasing trappings of the English. His magnificent bungalow on Haudin Road is filled with books, all in English. His tables are littered with copies of the *Economist*, volumes of Thackeray. Pipe-smoking, dressed in British-looking shirt and slacks, he looks as English an Indian as I have ever met.

But he deplored what the British had

Mixed signs of prosperity: under an ad about high-tech careers (left) migrant construction workers camp near a building site; (above) computer wizards talk shop at the NASA pub.

done in "imposing," as he put it, their English language on his country. He understood the administrative convenience of it, of course. He could see why the educated classes in modern India believe English is something worth inheriting. "It allows a fellow like me to read the *Guardian Weekly*," he noted. "It lets someone in Bengal read the books of R. K. Narayan." But he went on to assert a standard set of views holding that the English language stifles Indian-ness and widens the gulf between social classes; that it is, in fact, a kind of lingering linguistic imperialism. "It means that to come to public notice here," he said, "you have to speak in a foreign tongue. And that can't be right. A Polish woman won the last Nobel prize for literature. There is pride in Poland for Polish, as there should be. But do you think any Indian who writes in anything other than English would stand a chance?"

He wasn't finished. "If I hire someone to work for me, I'm frankly much more likely to be impressed by his English skills than by his intelligence. He can be a genius of a mathematician, but if he has poor English—I'll give the job to someone far less well educated, far less clever, who speaks good English. Is that right? I'm sure it's not."

But what about Bangalore, I wondered. English has become the dominant language of business and science in Bangalore and all over the world—and not because England foisted it upon its colonies. Not the least of the reasons for the city's new prosperity is the arrival, a decade ago, of the computer industry and other businesses that, like it or not, are almost universally conducted in English. Scattered around the city, there are new firms with familiar names—IBM, Hewlett-Packard, Dell, Acer, Philips—and new buildings are going up in industrial parks on all sides, with production lines churning out computers and printers bound both for export and for the local market.

Software engineers—those talented and mathematically minded men and women that today's Indian universities produce in the tens of thousands—flock to Bangalore. I stayed at the Taj Residency Hotel, and each breakfast-time, under the dining room's slow fans, and over glasses of fresh-lime soda, I would listen in on conversations between jet-lagged but tough-looking Americans in suits and eager young Indians in blue jeans—about deadlines for this new piece of code, for that new patch. Every conversation was in English, the speakers divided only by the depths and peculiarities of their accents.

My oldest friend in India, Shukla Bose, is a typical beneficiary of the Bangalore computer revolution. Six years ago, when she was asked by her American company to set up a computer-based operation in India, there was no better place than Bangalore. She came down from where she lived, in Bombay. "All the talent is here," she says. "The weather is good. The place is stable. The workforce is highly educated. Good English speaking. Excellent technical abilities. It is the perfect environment for a high-tech industry."

Bose's firm now has 60 machines—all state-of-the-art, Pentium-based, fully networked, Windows 95-capable—connected by a satellite uplink to her company's home base in Indianapolis. Her only concession to the ruder realities of India (aside from such only-in-India details as the occasional flickering incense shrine beside a computer terminal, and the sacred cows moving ponderously about in the streets outside) is a diesel generator on constant standby: like almost all power stations in the large cities, the local utility—characteristically unreliable—cuts power to her brand-new glass-and-steel building off Brigade Road for two hours each morning and two hours each afternoon. A vast influx of people into the cities and rapid industrializa-

tion have overwhelmed the aging power systems of India.

I related to her Captain Prabhala's anger over the dominance of English. "A nicely romantic view, of course," she retorted. "But quite impracticable. You want to get on here in India, or in China, or in Brazil—you need English. It's a fact of life." Although Bangalore is the most changed of Indian cities, physical relics of the Raj—the period of British rule in India—pervade, and in places relics of its attitudes do, too. The remaining architectural monuments left over from the Raj are crowned by something that you practically never see in other Indian cities—a large and imposing statue of a splendidly unamused and very regal-looking Queen Victoria.

She is illuminated at night, magnificently presiding in the middle of a busy traffic circle. Up in the capital, in Delhi, or across the subcontinent in Calcutta, such memorials are pretty rare: in both of those cities there was an orgy of deliberate renaming (as when Calcutta's Shakespeare Lane became Ho Chi Minh Sarani), not to mention assisted forgetting. Many statues of imperial figures like Robert Clive have long been consigned to distant meadows and left to molder. North of Delhi there is a field where three Queen Victorias lie at drunken angles and are browsed around by cows; at Barrackpore, a few miles up the Hooghly River from Calcutta, you may find Warren Hastings and the Marquess of Reading, both headless and on their moss-thick sides, lying in a forest of tall grass and palms.

But in Bangalore almost all the structures that the British left remain, decaying only a little in the hot, damp air: molded insignia on mailboxes, imperial carvings on porticoes, grand crests on wrought-iron gates. There is the fine Residency, a neat little branch of Higginbotham's Bookstore. There is elegant St. Mark's Cathedral, musty and incense-rich inside, with brass plates still polished to a high shine commemorating soldiers who died of various poxes and fluxes or encounters with tigers after remaining in India beyond the average two-monsoon limit.

There is the grand and straight-out-of-Eastbourne West End Hotel, in the huge gardens of which I found men perched high in the trees picking tamarinds that they obligingly tossed down for me to try. There are two fine railway stations—one Bangalore City, the other Bangalore Cantonment. And on the thousands of classical Bangalore bungalows, all fretworked hardwood with gardens rich with roses and delphiniums, there are the marble nameplates from six decades ago, which the present residents haven't the heart to take down: "Dr. James McMurray, Richmond Road." "General Sir Richard Garvey, Cockburn Lane."

The British had the idea, when they built grand buildings in India, that the very grandeur might help preserve the institutions they housed once the British had departed, as they knew they one day would. Build a grand-looking parliament—and parliamentary democracy may have a better chance to

Although popular for tourist snapshots, the stately High Court Building houses a venal and Dickensian legal system.

*The British had the idea, when they built grand buildings in India, that the very grandeur might help preserve the institutions they housed.*

survive. Build fine law courts—and enlightened law and British justice may endure. Leave behind good and solid-looking police stations—and the nation may be well and solidly policed.

Such preservationist thinking is apparent all around Bangalore. The city library, the museum, the post office, the police station—all seem to say, monumentally, *Keep me as I am*. The most notably impressive building of all is the one that houses what was intended to be the linchpin of British colonial inheritance, a legal system based on English common law.

The building that houses the Karnataka High Court today certainly looks the part. It is an immensely long two-story structure, all tiers of columns and Pompeian red brick. It positively reeks of rectitude—a demand in tons of solid brick that the law should remain inviolate and be as fair for the independent Indian of today as it was for the subject Indian of the British yesterday. The white-collared lawyers who dash in and out; the cool courts within; the crest above the judges' heads with the Sanskrit rubric *Satyameya Jayate*, Truth Shall Win—all suggest incorruptibility.

I was taken around the high court by a young lawyer, a man working for a firm with offices all over India, as well as in London and New York, and who is thus well versed in the ways of foreign courts. We went first to the court of the state's Chief Justices: two perspiring men in dark suits and white tab-collars, presiding from a high bench over a courtroom filled with similarly dressed and similarly sweating lawyers, each waiting his turn to present a petition. The first lawyer stood and with great rhetorical flourishes began to "Humbly submit" and utter phrases like "May it please the Court" and "Could I kindly approach, Your Lordship"—the kind of language still heard any day at the Old Bailey in London. It was quite difficult to understand him fully, so flowery was the language, but it seemed all to do with a case that had first been heard in a court downstairs—back in 1982.

After ten minutes the judges idly waved the man to sit. A second lawyer promptly jumped up and began a similar rattle of head-wagging obsequiousness. His case, it developed, had been first judged in 1979. It seemed positively Dickensian, right out of the infamous case of *Jarndyce* v. *Jarndyce*. This time I turned to my guide, astonished. "So long?" I said.

"Oh yes," he replied matter-of-factly. "Fifteen years, twenty. The backlog here is quite terrible. A man can be before a court for a third of his life. But this is not the worst." We moved on to a rather less majestic set of buildings that housed the middle-ranking civil courts. The crowds here were terrific. Under a row of thatched eaves a hundred men with battered typewriters were hammering out petition documents in English for supplicants who either could not read at all or had little command of the tongue. Twenty rupees (65 cents) a page seemed the average copy charge.

A lawyer colleague of my guide was about to present a client before a judge. It was an open-and-shut case, he explained. The client, a merchant in a village outside Bangalore, stood accused of poisoning several people by distilling hooch that contained a modicum of methyl alcohol, which has been known to make people blind. The lawyer proposed to get him off.

"How?" I asked. "First it is technical arguments we will be trying," he said. "And if they are not found to be working—ah, well . . ." He patted his coat pocket, opening his jacket a little to display a brown envelope, thick with folded paper. A bribe. I looked at my guide. "I am afraid so," he said dryly. "It happens all the time. Perhaps this is why judges are so fat." He said this while pointing out a portly man just then being helped by bearers into a sleek black car.

"We have not done well with what we inherited," he continued. "In the name of efficiency we abandoned the

jury system here in the 1950s. The judges make all the decisions. A major mistake; the jury is one of the things we want to reintroduce. The Karnataka Bar Association has petitioned the government to bring it back, as a means of lessening the possibility for corruption. But this will take many years, if it ever happens."

As my time in Bangalore continued, I met with surprise after dismaying surprise. Everywhere I looked, it seemed as though the British legacy was subject both to criticism and corruption. Every institution that Britain had masterminded for the jewel in their vast empire. Even the railways.

The British built a huge network of them across India a century ago, and from far-off London they seem a proud and useful creation. But a glimpse at a crowded overnight mail train creaking into Bangalore Cantonment station, with hundreds of commuters on its roof and scores of indigents crowding the platforms, is depressing. The locomotives are rusty, dirty and polluting; the tracks are broken-down. Regularly the *Deccan Herald* carries reports of accidents that would have made the front pages in America but here are buried among the routine news.

Indians grumble about their overburdened railway system for being hopelessly inefficient and backward compared even with railways in many other developing countries. What's more, some claim it is backward precisely because the British insisted that India inherit something that was both state-run and centralized, to help unite a country composed of so many millions of people (950 million today) deeply divided by territorial feuding, language and religion. But some Indians that I met now argue in favor of regional railways, privately run—and they point to Britain's own sweeping reorganization of British Rail, along those very lines. (They are really talking about central administration, not about rolling stock and equipment. If India's regions had totally suited themselves there might have been a number of different track gauges, and transshipment by hand at many borders.)

*The British view was that a railway system would help unite a country composed of so many millions of people divided by territorial feuding, language and religion.*

Indians grumble about their overloaded, antiquated rail system, although it faithfully serves even the remotest villages; some blame the British for its shortcomings.

Not surprisingly, they are equally critical of government bureaucracy. The government office-worker in India is characterized, or caricatured, as a painstaking and honorable clerk, a little man who spends a lifetime managing the intricacies of India with just a quill pen and a fine sense of decency and fairness. Is this a reasonable image?

"Total nonsense," snaps T. P. Issar, a major figure in the Indian Administrative Service and a man who in his retirement has written a trio of well-regarded books on Bangalore.

"The slowness of the British system remains," he says. "The dedication to duty, too. But are the bureaucrats of today fair? Wise? Not at all. A few, very few and very senior, may be. But more likely they're scared, obstructive, quite unwilling to make a decision. They are afflicted by the babu mentality."

Overhearing this, a colleague chimed in—we were having lunch at the Bangalore Club, under a framed record of a bill presented to the young Winston Churchill when he was a subaltern here in the mid-1890s, and which he was too hard up to pay.

"Do you know why we Indians never seem to get on?" asked the newcomer. "If only you British had taught us how to decide, how to be bold. If

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only we had been taught by people like him"—he gestured up to the Churchill bill—"it would have been a great deal more useful."

I have one old Indian friend in Delhi who disagrees, and violently. His name is Rabindra Seth, and he believes that, although British changes in India were made for the benefit of the British Empire and not for the Indian people, the legacy has on the whole been excellent, even crucial to India's survival as a nation. He is ex-Indian Army, and though his admiration extends to include the British-style judicial system as it used to be, the English language, and the sense of fair play inculcated by such passions as (he means this quite seriously) the game of cricket—his greatest esteem is for the army. What impresses him is its determinedly apolitical nature.

India has a big army—a million men, 30 divisions, 2,400 tanks, some missile units, 160 helicopters—among the largest in the world. The navy and air force are large as well. India has powerful potential enemies on its borders—Pakistan, most notably, with whom in the past 50 years there have been two full-fledged wars over Kashmir—and all manner of interesting troubles brew and bubble inside India's borders.

Violence and instability, after all, have plagued India since Independence. The Mahatma, Mohandas Gandhi, shot dead in 1948. Prime ministers Indira Gandhi and her son Rajiv, both assassinated. There have been language riots and caste riots and, three years ago, terrible communal riots that pitted Hindu against Muslim with anger and venom of the kind that erupted after Partition in 1947, when an estimated one million died and the then young army was struggling hard to keep order.

There is a constant temptation to the armed forces—to intervene, to bring to India the kind of stability that the military, and military officers, tend to favor. And in almost every neighboring nation—Pakistan, Afghanistan, Bangladesh, Sri Lanka, Burma—the army has at one time or another moved out of barracks, and taken power, or played a vital part in the running of its country. "But," said a general I was interviewing, "not once have our boys been tempted to intervene.

"Not once. It is something of which we all are tremendously proud. Older officers teach it to the new recruits. It has become a sort of mantra—we repeat it so often, everyone believes it." He told me this while showing me around his household—British-built, its walls hung with watercolors of Mughal ruins of the kind *memsahibs*, weary of outpost life, might have done a century ago to pass the time. He offered me tea—the pot had a cozy, there was a slop bowl, a strainer, biscuits on a doily. A copy of the *Illustrated London News* lay on the tea table.

*Lining the tops of the sandstone walls, in perfectly delineated silhouettes, stand the desert cameleers of India's Border Security Force. The camels are caparisoned, the soldiers' rifles are held at full salute, and they stand silent and rock-still, camel after camel after camel, against the gold of the evening.*

I remarked on how very British he and his surroundings seemed.

"And my dear boy," he exclaimed, "that's part of what is so good about us. We serve the president of India, just like your boys serve Her Majesty the Queen."

It is perhaps not too surprising, considering the enduring and unchangingly British nature of the Indian Army, that a military ceremony that is staged each January in Delhi makes it seem, at least for a brief while, as though the British had never left.

It all takes place at the very end of an hour-long ceremony called Beating Retreat. Thousands of soldiers, airmen and sailors have been paying public respect, in quick time and at slow march, to India's aged civilian president and his assembled government. It is a massive affair, as suits a nation of such stupendous size and with such vast armed forces.

For 50 minutes there is drumming and skirling and marching and countermarching, the wailing of bagpipes and the shrilling of cornets, and the coordinated crump of many thousand steel-shod boots. Then, suddenly, the massed bands fall silent, and the crowd does, too.

The hush is huge and loud, as only an Indian hush can be. There is usually the clatter of a fallen rifle. Someone coughs. A child, unseen in one of the distant bleachers, wails its alarm at the unexpected quiet. Brown kites turn lazy circles above. The sun slides behind the monuments, shadows steadily lengthen, and the air grows purple. Even here on the burning tarmac, it starts to get a little chilly.

Music begins, faintly, but swelling. For the first time in the evening it is not martial music—not "The Voice of the Gun," which went last, nor the "Everest" fanfare, which went before that. It is instead what all in the audience have been waiting for, the beguiling moment of the evening. It is, we have had explained to us a score of times, the Mahatma Gandhi's best-loved hymn. It is "Abide With Me."

Although it is the most British of hymns, here it is performed by Indians—it is played by soldiers in an Indian army in front of a Hindu president, before a cabinet whose members include Muslims and Jains and Sikhs and Buddhists, too, and before a throng in which all religions and all castes and outcastes, from Brahmans to Harijans alike, are sitting and listening. It is probably performed with more feeling here, at the base of this low Indian hill, than anywhere in the rest of the world.

Lining the tops of the sandstone walls, in perfectly delineated silhouettes, stand the desert cameleers of India's Border Security Force. The camels are caparisoned, the soldiers' rifles are held at full salute, and they stand silent and rock-still, camel after camel after camel, against the gold of the evening. And all the while the hymn plays slowly to its end. "Change and decay in all around I see; Oh Thou who Changest Not, Abide with Me."

I have always wondered if it was that line in particular that inspired the wily old Mahatma to choose the hymn. For change is something that Indians, even in a now much-changed city like Bangalore, regard with extreme wariness. Theirs is an ancient society, with customs and religions part of a history far longer than anything in the West. In the context of its agelessness, a century of British influence, a century of outright rule and the 50 years since now seem no more than a blink of an eye. Which lends a measure of irony and a measure of sweetness to the Mahatma's hymn.

*The author, who last wrote for us on Sir Francis Drake (January 1997), was the* Guardian *correspondent in India for three years. Raghu Rai was named "Photographer of the Year" in 1993 for a story on the wildlife of India.*

# THE MAN WHO BUILT THE TAJ

ONLY A MAN WITH ENORMOUS RESOURCES, both monetary and artistic, could have built the Taj Mahal. That man was Shah-Jahan, fifth in a line of Muslim rulers called Mughals who controlled northern India from 1526 to 1858. So impressed were European visitors with the exotic opulence of the Mughal court that they coined the term "mogul." ◆ Now, at the Arthur M. Sackler Gallery, a magnificent manuscript is on view that provides a detailed window on this world. Entitled the *Padshahnama*, it is a handwritten history of the first ten years of Shah-Jahan's reign (1628-58), complete with 44 paintings of significant events such as battles, beheadings, hunting outings, court scenes and the exploits of his sons. Owned by the Royal Library at Windsor Castle, the bound manuscript has been taken apart for conservation, providing a rare opportunity to see all of the paintings at the same time. Before returning to Windsor Castle, the *Padshahnama* will travel to the Metropolitan Museum of Art, the Los Angeles County Museum of Art, the Kimbell Art Museum in Fort Worth, and the Indianapolis Museum of Art. ◆ One person we never see in the manuscript is Shah-Jahan's beloved wife Mumtaz; nor do we see the Taj, the famous tomb he had built for her after she died in 1631. The only women we see are court dancers and other entertainers; it was taboo to depict royal women. Shah-Jahan himself lived the last eight years of his life a prisoner of his son and successor, Awrangzeb—locked in a fort from which he could look across the river at the Taj. —*Constance Bond*

Scenes from a life: on page 57, Shah-Jahan, accompanied by his royal entourage, is greeted by an apparition of a Sufi saint; the king (opposite) is weighed on his 42nd birthday against gold and other precious substances, which will then be distributed to the needy; during the weighing ceremony, court girls dance to the accompaniment of musicians (above). Most of the paintings in the *Padshahnama* measure approximately 9 by 13 inches.

Shah-Jahan, at upper left, watches as his son Awrangzeb confronts a raging elephant, a sport reserved for royalty.

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An early silent movie has all the ingredients of a classic Wild West poker game, from grizzled cowboys to the mirror behind the city slicker.

CULVER PICTURES

# Fake & Rake

## Played for love or played for money, poker is coming out of the back room

BY NANCY SHUTE

I was dead before I even sat down. To my right sat Barbara Enright, the world's winningest female poker player. Arrayed around the felt were other living legends: Tom McEvoy, a Michigan accountant turned world champion; "Pug" Pearson, who looked like Santa Claus and played like the Devil; tournament host "Cowboy" Wolford and cofounder "Oklahoma Johnny" Hale; top Australian player Marsha Waggoner; and Bruce Van Horn, an Ada, Oklahoma, pathologist who'd placed second in the 1996 World Series of Poker.

They were all at California's Oceanside Card Casino for the 1996 Seniors World Championship of Poker. This was an organized tournament, meaning that 120 people had "bought in" at anywhere from $300 to $1,000, along with an $80 entry fee. After days of round-the-clock play, the 30 players with the highest scores would get prizes totaling $100,000, with the top winner bagging a cool $35,000. And for a fish (the poker equivalent of a mark), I was feeling dangerously optimistic. Earlier that day Doc Van Horn had persuaded me to play in a "satellite" game, which gave me a chance at winning entrée into the higher-stakes rounds. I'd paid my $60 and entered a pot-limit Texas hold 'em game, and I'd done better than any 50-cent-limit home-game player deserved, winning a hand and disgusting the toothpick-chewing guy to my right. "She had the nuts!" he shouted when I beat him with a full house. (Texas hold 'em is a variant of seven-card stud. Players are

PHOTOGRAPHS BY CATHERINE KARNOW

dealt two "hole" cards facedown. They bet. Then the dealer turns three communal cards faceup. There's another bet, followed by a communal card, a bet, a communal card and another bet. Players make their best five-card hand out of their two hole cards and the five shared cards.)

But this game was twice as fast as the earlier one. "Welcome to the wonderful world of no-limit hold 'em!" Tom McEvoy said. "I'm all in," Doc or Tom or Pug would declare, and chips slid back and forth. Rattled, I called with an ace-deuce in the hole. "Baby, you shouldn't call with nothing," Barbara whispered in my ear. "Write that down!"

So I folded again and again, but my stack of chips was shrinking fast, thanks to the blinds—forced bets that build the pot and speed the game along. Within ten minutes, they'd busted me; my only consolation was that I outlasted a 79-year-old retired wine salesman from New Jersey. My heart was pounding so fast I was dizzy. But for a few brief moments I'd played poker with the best—not bad for a nice girl from the Midwest.

For almost two centuries poker was a manly, deliciously illicit game played in saloons, speakeasies and smoke-filled back rooms. Even ten years ago, only Nevada, California and Montana had legal games. But now poker's gone legit—legal in casinos in 20 states, it's also played on the Internet, broadcast on ESPN, and featured in hundreds of tournaments luring low-stakes players with cars and $100,000 prize pools. And it's the only game in the world where amateurs play with the pros and win—imagine doing that with Steffi Graf or Tiger Woods.

Poker has insinuated itself into culture, from language (who would trust a four-flusher?) to highbrow literature (in Paul Auster's *The Music of Chance*, with high-stakes poker as existential metaphor) to TV's *Maverick*. The game stars in dozens of movies, from *Destry Rides Again* (1939) to *The Cincinnati Kid* (1965) to *House of Games* (1987). In *Big Hand for the Little Lady* (1966), Henry Fonda has to teach Joanne Woodward to play poker to win back the family fortune. In *California Split* (1974), George Segal and Elliott Gould star as down-at-the-heels low-limit players. You'd think that Hollywood screenwriters didn't know how to end a movie without a high-stakes showdown. "Poker? Isn't that gambling?" W.C. Fields was asked in *My Little Chickadee* (1940). "Not the way I play it!"

Poker has always been democratic, open to anyone willing to risk his bankroll, and its history parallels America's. It was born in the late 1700s in New Orleans, of forebears that include betting-and-bluffing games in Persia (*as nas*), France (*poque*), England (brag) and Germany (*Pochen* or *Poch*). In 1803, when the Louisiana Purchase opened up the Western territories, the riverboat gamblers took poker with them. This early version used a 20-card deck with four suits; by the mid-1800s it had adopted the 52-card deck and was listed in game books.

Poker quickly proved itself useful to a restless young

A classic poker face, "Cowboy" Wolford (above) fingers his chips at the 1996 Seniors World Championship of Poker; Barbara Enright (right), the world's winningest female player, gave him a run for his money.

nation. It was fast, simple enough to learn in a few hands, and could be played by 2 to 10 players. Unlike blackjack, it required no permanent dealer. Unlike roulette or slot machines, it rewarded skill, both in knowing the odds of making a hand and in assessing the psyches of the opponents. And best of all, you could make serious money, although not without serious risk. One day in 1876, Wild Bill Hickok failed to take his habitual seat with his back safely to the wall in the Number 10 saloon in Deadwood, South Dakota. A young drifter entered and shot him dead, allegedly paid by other gamblers. Hickok's final hand, pairs of aces and eights, became known forever after as the "dead man's hand."

Of course, if poker were purely a game of skill, it would not prompt homicides; when's the last time someone got shot over a game of chess? But poker is also a game of chance: the best of players can get "bad beat" by the random distribution of the cards. Poker thus draws those who would bet on horses, football, jai alai, the stars in the sky. Back in the 1920s, gambler Nick "The Greek" Dandolos lost $605,000 to mobster Arnold Rothstein in a single hand of stud poker. Dandolos told Rothstein: "You gamble for greed. I gamble for thrills."

"But you can't eat thrills," Rothstein replied.

"True," Dandolos said. "But neither can you replace them by anything."

And nothing beats thrills and cash combined. Richard M. Nixon knew that. As a callow lieutenant commander with the Pacific Fleet, Nixon played marathon poker games, accumulating a reputation as a tightfisted, emotionless player—and a large portion of the $10,000 bankroll that financed his entry into politics. "Any kind of gambling had been anathema to me as a Quaker," Nixon wrote in his memoirs. "But the pressures of wartime, and the even more oppressive monotony, made it an irresistible diversion." The Nixon Library still proudly displays a pair of deuces that the future President deployed to bluff a $1,500 pot.

The Quakers' scruples against poker were not misplaced. For most of its history poker has been a dubious enterprise, played by rogues who most certainly did not play according to Hoyle. Cowboy Wolford, resplendent in rhinestone-studded overalls, remembers when "you had to worry about getting robbed, the police were raiding you or you were getting cheated." He was a young man back then, playing poker town to town in the winters, when he wasn't riding in rodeos. Now he's 66 and playing in professional poker tournaments. And Pug Pearson's been on the make since he was a 9-year-old on the streets of Nashville, Tennessee. "I shined shoes, sold papers. My ambition was to get a 16-cylinder Cadillac and a pool cue and be a hustler." He started hustling poker, too, going to Las Vegas in 1955; he figures he used to go broke 40 times a year. Now he's 69 and still working the angles. "If I'd had my choice I would take some other life," Pearson said, chewing on the last inch of a thick cheroot. "I like people, especially kids. I would like to be more of a benefit to mankind than I've been."

Two other pros who played in the Seniors showdown were "Oklahoma Johnny" Hale (left), one of the tournament's founders, and "Pug" Pearson (above), his hat embellished with the much-coveted royal flush.

Like Cowboy and Pug, many of the old-time poker players came from rural Texas and Oklahoma and parts of the South. In long hours in bunkhouses and back rooms, they honed their wits, guile and intuition, learning to spot when a twitch was a "tell" that revealed high cards or a bluff. But in the 1970s poker discovered science. "They ruined it," says Amarillo Slim, whom I found coolly demolishing a competitor in Oceanside. ("I didn't even look at my cards," he drawled, raking in a $7,000 pile of chips with a hand flashing an inch-wide gold ring in the shape of Texas. His opponent went "on tilt" and busted out of the game, furious. "He hasn't got the guts of an earthworm," Slim proclaimed as the loser stalked off.) "Used to be, there was a very small field of us," Slim continued. "Now there's a jillion players. Some of the young fellows who were clever wrote books and woke up everybody."

*They keep the cards so low to the felt you'd think they were dirty pictures.*

Marc Gilutin, center, in the white shirt, and his Saturday-night poker group in Playa Del Rey, California, play only for fun, keeping track of winnings in a ledger.

Actually, one of those clever fellows was an old Texas poker partner of Amarillo Slim's—Doyle Brunson, a good old boy with a bald pate, a belly as big as Pecos County and cogitative skills so capacious he could recall hands he played 30 and 40 years ago. Brunson was one of the best high-stakes players, the kind who could win $1.3 million in a single hand and not lose his cool. After he won the World Series for the second time in 1977, people urged him to write a book. The result: *Doyle Brunson's Super/System*, a 650-page tome that quantifies 25 years of hard-won poker knowledge, right down to the probability of being dealt specific deuce-to-seven low hands before the draw. Nobody had ever seen anything like it. "Everyone said it would hurt people like myself," Brunson, now 63, says. "But actually, it helped the game a lot."

Other books followed, written by players such as David Sklansky, Mike Caro, Mason Malmuth and Nesmith Ankeny, that each used sophisticated mathematical analysis and game theory to pinpoint strategies. Between the books and computerized poker games, a person could learn without paying steep tuition at the table. "The level of skill went up dramatically," says Jim Albrecht, director of the World Series.

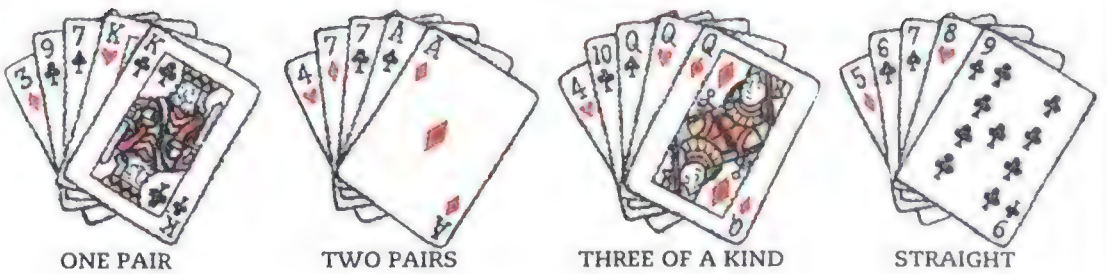
Old-timers also credit the World Series, founded by Benny Binion in 1970, with helping to clean up the game, bringing it out of the back rooms and making it a legitimate competition. "Poker's gained respectability, is what it's done," says Brunson. "People I went to college with would turn away on the streets. Now they call me up in Las Vegas and want to go out to dinner."

But prejudices linger; even though the games are honest, one player's gain is still another's loss. Doc Van Horn, 58, had been a good poker player since college, but he surprised himself when he won $585,000 at the 1996 World Series, his first try at the championship. He bought himself a gold bracelet like the champions wear. His wife, Sherry, bought a new Chevrolet pickup. A few weeks later, members of Van Horn's First Baptist Church discussed the morality of poker playing. While some questioned the merits of "evil money," one woman said: "God doesn't care where it's from!"

But it would be hard to find a den of iniquity less iniquitous than the Oceanside Card Casino, a brightly lit, family-run hall with 15 tables and Mylar balloons reading "Good Luck!" and "Don't Go On Tilt!" taped to the oak-paneled walls. You can't even drink here: it's against local ordinance. But you can play seven-card stud, lowball, hold 'em and Omaha, 24 hours a day, 7 days a week. The room is alive with the *click-click* of nervous gamblers tapping their stacks of chips.

"What we have here today is some of the most skilled poker players in the world working to defeat each other," said Oklahoma Johnny Hale, one of the organizers of the Seniors World Championship. "The egos are as big as a mountain!" True. But unfortunately, watching egos collide in a high-stakes tournament is about as exciting as watching yogurt culture. You can't see the players' cards; they keep them so low to the felt you'd think they were dirty pictures. Hour after hour they play tight, folding hand after hand as they wait for others to make mistakes and the bets to increase to the point where it's worth going in—they're a "rock garden," in poker slang. By the final game, even the players look bored. Barbara Enright, in wraparound shades, pages through the newspaper and snaps open her cellular phone. Tom McEvoy takes off his glasses and buries his face in his hands. Pug Pearson's girlfriend massages his shoulders. Doc Van Horn stares into space from under his "Ada Cougars State Champions" cap. But from the tedium emerges a truth: poker rewards not "gambling," but concentration, discipline and the ability to control emotions, even when the big hand finally hits. After nine hours, the field has ground down from 33 to 18; the tournament manager calls it a night. The players sigh and trudge off to dinner; it's been a long day at the office.

## A Poker Starter Kit



ONE PAIR
1⅛ to 1

TWO PAIRS
20 to 1

THREE OF A KIND
45 to 1

STRAIGHT
250 to 1

**RANK OF THE HANDS**

Here are the relative rankings of hands from one pair (upper left) to a straight flush (lower right), along with approximate odds against getting each hand. Odds are based on a five-card hand as dealt to one player. All poker hands eventually consist of five cards, regardless of the game played. No suit prevails over any other. Odds against a rare "royal flush"— ace, king, queen, jack, ten, all of one suit—are 650,000 to one.

**TWO COMMON GAMES**

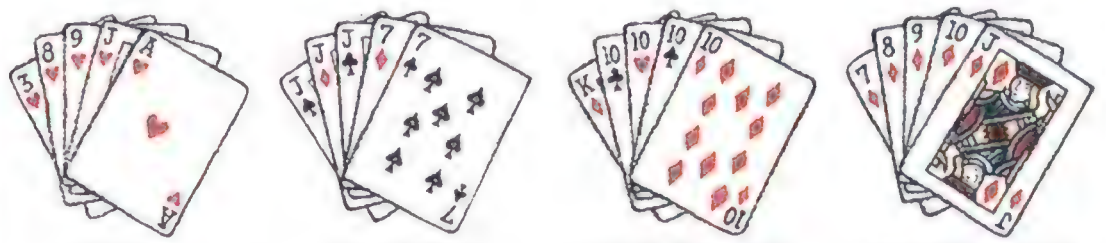
The common poker games from which many popular variations flow are five-card draw and seven-card stud.

**FIVE-CARD DRAW:**

Players are dealt five cards, facedown, so that only the player receiving them can see them. Players bet. Then each player can replace unwanted cards. They bet again, and perhaps continue rounds of betting, raising the stakes. Cards speak; the high hand wins.

**SEVEN-CARD STUD:**

Players are dealt two cards facedown (the hole cards) and one card faceup. The player with the highest card showing opens the betting. Three more cards are dealt faceup, with rounds of betting in between. The last card is dealt facedown—"down and dirty." Players make their final bets. The player with the best five-card hand from the seven cards wins. Losers weep.



FLUSH
500 to 1

FULL HOUSE
690 to 1

FOUR OF A KIND
4,000 to 1

STRAIGHT FLUSH
72,000 to 1

On the other side of the cardroom, the low-limit games that are unrelated to the tournament are far livelier and filled with Oceanside regulars: marines from nearby Camp Pendleton, a retired jeweler, a grade-school teacher, and Elia DeMaria, whom everyone calls Miss Elia.

"I know gambling is sinful, but we're all churchgoing people—and there are so many nice people here," says Miss Elia, an 80-year-old who, with her short gray hair and pristine pink sweat suit, looks like the ideal grandmother. But she's still angry about how, years ago, a boorish brother-in-law used to shout "No women! No women!" during kitchen-table poker games. When her husband asked her to try low-limit lowball in the cardrooms near Los Angeles, he didn't have to do much persuading. Eventually they each had a $3,000 poker fund; they never had to replenish them. Then five years ago, her husband died. "My neighbors never even called me up. I was so hurt." She hit the tables, and ran through the entire $6,000 in a year. "I just didn't care."

Things are better now; she limits herself to a $250 stake and comes three times a week just for the company. Last spring the casino held a luncheon and fashion show in her honor. Over by the bank ATM there's a framed photograph of her and the other women regulars, with a poem: ". . . Well, Miss Elia, we all love you. Bet all you've got on that. That's one bet you won't lose unless the world is flat."

It's gamblers like Miss Elia who are fueling the nationwide boom in casino gambling—at casinos that now market themselves as a family alternative to an evening at the movies. These days a person can play poker not just in Las Vegas and in California's 200 cardrooms, but in Atlantic City, New Jersey; Biloxi, Mississippi; Tulalip, Washington; Ledyard, Connecticut; and Sault Sainte Marie, Michigan. Casino owners are quick to tell you that, for many of them, poker's a loss leader; they make more money per square foot on slots,

where skill can't better the odds and newcomers don't feel intimidated.

But thanks to greater geographic distribution and hundreds of new tournaments, poker is more visible than ever. Many more women play, particularly in Las Vegas. Poker's big in Australia, Germany and England. Tour companies promote poker cruises to Alaska and the Caribbean. *Card Player* magazine tracks the doings of professional and recreational players. Specialized bookstores sell dozens of videos and books, from classics such as *Maverick's Guide to Poker* and Brunson's *Super/System*, to *Mathematical Analysis of Bluffing in Poker* and the far more enticing *Play Poker, Quit Work and Sleep Till Noon*.

Poker flourishes on the Internet, from IRC (Internet Relay Chat) poker that allows people thousands of miles apart to play real-time games, to newsgroups and Web pages where players dissect strategy, mull the merits of various cardrooms and post trip reports.

One of poker's young up-and-comers, Ted Forrest, seated at left, studies some of the competition at the Taj Mahal Casino in Atlantic City.

*Atlantic City is a tough town but a good place to see the poker legends of the future.*

Road trips and poker, it seems, go together like Bob Hope and Bing Crosby. My 17-year-old poker group was smug about our motor-home cruise from Washington, D.C., to Austin, Texas: 1,600 miles of barbecue, beer and cards, from seven-card stud to fake 'n' rake (a five-card-draw game dear to bluffers, in which players turn up their cards one at a time, between rounds of betting), with breakfast in the Greenville, Mississippi, jail (we knew the sheriff).

That was before I heard about BARGE (Big August Rec Gambling Excursion), the annual casino field trip that includes hundreds of aficionados from the Internet poker newsgroup. That was before I heard about a Westchester County, New York, group that pooled their antes to finance a trip to the Bahamas. And that was before I heard about the Tiltboys, a half-dozen recent Stanford graduates and their friends, whose escapades, fueled by Rusty Nail and Green Apple cocktails, would delight Dean Martin. In their trip report "Tiltboys in Panty Jose," the troupe describes crashing a ladies-only poker tournament at a California cardroom, dressed to win in velvet gowns and large-sized lingerie. "The security of the group gave way to the vulnerability of being an attractive woman alone in a crowded poker room," "Brucilla" reported on the Tiltboys home page.

A few months after the Seniors World Championship I went to Atlantic City, New Jersey, where I found Doc Van Horn playing in a new $4 million tournament sponsored by Donald Trump and still wearing his lucky Ada Cougars cap. Atlantic City was a tough town; Doc missed the congeniality of Ocean side. But "we're not doin' it for the fun, we're doin' it for the competition," he said, sitting down for another marathon session of hold 'em.

Atlantic City might not be friendly, but it's a good place to see the poker legends of the future: Huck Seed, a 28-year-old Caltech engineering dropout who beat Doc Van Horn in the 1996 World Series; Phil Hellmuth, a 32-year-old who turned pro at age 20, after beating the colleagues of his dad, an assistant dean at the University of Wisconsin; and Ted Forrest, also a professor's kid, from upstate New York, who started playing nine or ten years ago in Las Vegas, on a break from his job at the Grand Canyon. They meld strong quantitative skills with the horse sense of a young Amarillo Slim or Doyle Brunson. They also lack even a glint of their elders' glamour—no rhinestones or Texas-shaped rings for them.

"It's like mental combat," said Forrest, 32, looking no tougher than Beaver Cleaver in a gray hooded sweatshirt and jeans. "I enjoy that."

Most of the world's poker players will never play as well

as Ted Forrest. But every night of the week, in barns, barracks, pool halls, Boy Scout tents and basement rec rooms, tens of thousands of people are playing poker. For some the home game is a leisurely social event; for others it's a competition, where worth is measured in dollars won. "Poker is a game played among folks made equal by their money," wrote David Mamet, playwright and longtime poker player. "Each player uses it to buy his time at the table and, while there, is entitled to whatever kind and length of enjoyment that money will buy."

Every Tuesday at 5 P.M., Patrick Gilvary faxes the cold cuts order to the deli, hangs the green-shaded light fixture and rolls the custom-made felt-topped table out of its special slot in the wall of his Red Bank, New Jersey, architectural office. He says he learned poker at his mother's knee. "After Christmas dinner, Easter dinner, the table would be cleared and the penny jars would come out."

He found this game 15 years ago, at a boathouse. "It was old and raggedy, and the guys were old and raggedy. There were times it was so cold you could see your breath." Since then, Gilvary, 52, has graduated from new kid to host; all the old-timers have died off except for Jim, a disabled World War II veteran. It's a friendly game; the men tell jokes and seldom win or lose more than a few hundred dollars. "Poker is a drag. Poker is boring," says Gilvary. "At its very best you play hundreds of hands for the one that's crazy."

Yet Gilvary says it would take "an act of Congress" to change the game. He loves it for the companionship, the competition ("it's a guy thing"), even just for the comfort of knowing where he'll be every Tuesday night. "Last year, Christmas Eve and New Year's Eve were both on a Tuesday. What are you going to do? We played on Monday."

Almost every Saturday night, you can find Marc Gilutin at a rec-room poker table in Playa Del Rey, California. His fellow players are a mixed bunch: a husband and wife, a mother and son. But what makes them different is that a few years ago they decided to give up the money. A regular had been going through a rough patch, and losing $50 hurt. So they set up a ledger (one of the players is an accountant) and pay purely on paper. By now two people are down $1,200 or so, and Gilutin's up a thousand, not surprising since he's a floor supervisor at the Bicycle Club Casino. Still, he doesn't seem to mind playing in a game that, with three jokers and, recently, two decks at once, would be laughed out of any casino. "I'd always played social poker for blood, but this game's different," says Gilutin, 50. "Some of them play poker very poorly, but we just love each other so much."

Violist Craig Mumm, standing, and other members of the Metropolitian Opera Orchestra in New York unwind after a Saturday matinee performance.

And Craig Mumm plays almost every night of the week, but only during intermission. He's a violist for the Metropolitan Opera, and when the patrons head for a flute of champagne, Mumm and his fellow musicians run to their lounge, where they have a permanent table. Intermission over, they stuff the cash into their tailcoats and rejoin *Aida*.

"Everyone needs a break from the concentration on the music," Mumm, 43, says. "You just need to relax and clear your mind. We also have cultural exchanges with our colleagues at American Ballet Theater and the New York City Opera. When we've got some free time and they're working, we walk across Lincoln Center Plaza and join their games."

The Met's backstage game has been ongoing for all of the opera's 114 years, as far as anyone can tell. It flowers when the company tours; in the days of trains, Car No. 6 was the poker car. And it welcomes guests. During one recording session Luciano Pavarotti came upon the table and exclaimed: "You play poker and you don't ask me?" There was a $2 limit. He promptly bet $50. "He lost," Mumm sighs. "But he loved it." Don't we all, Luciano, don't we all.

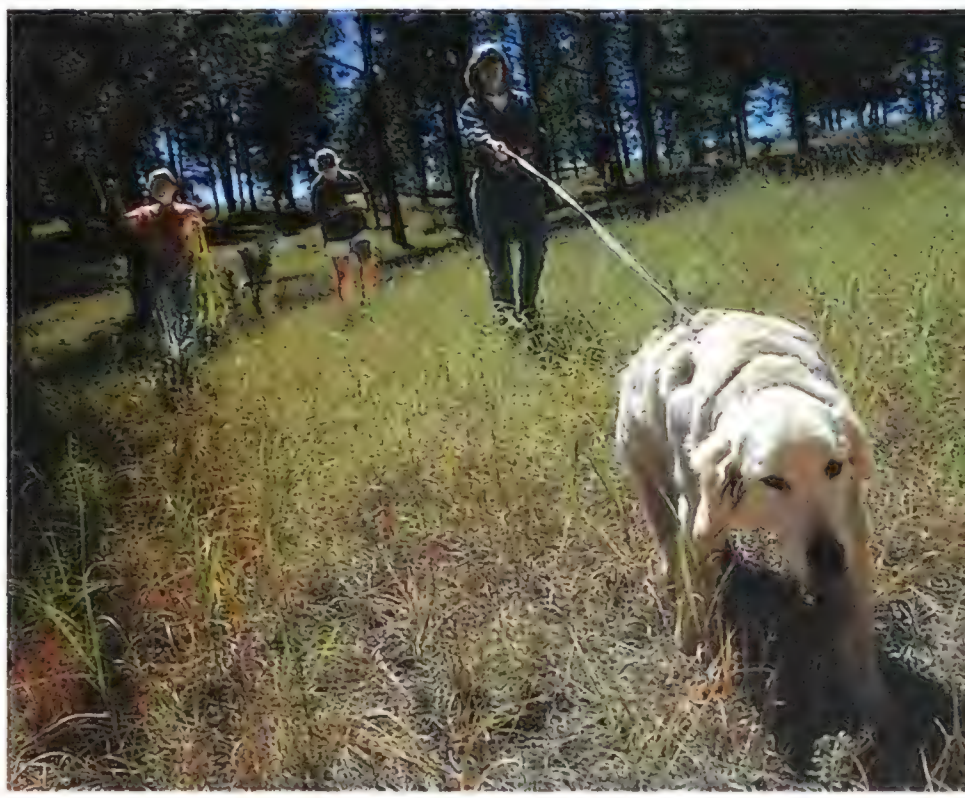
*Writer Nancy Shute won't try tournament poker again. Photographer Catherine Karnow confesses she still doesn't understand the game.*

For Rescue Dogs

# "Nothing's Better Than A Live Find"

During a practice rescue, Cassidy, a poodle certified for avalanche work, shows Carla Tomaszczyk, her handler, and Ted Bennett where the "victim" is buried.

BY CATHERINE DOLD ▪ PHOTOGRAPHS BY SCOTT S. WARREN



ELBOW BY ELBOW, LIKE A TINY MARINE, Tasha is crawling across the dirt. Her task is simple: slither under a pickup truck on the driver's side, crawl out on the passenger side. She's made it halfway, guided by the enthusiastic calls of her owner, Sue Purvis, who is squatting in the dirt near the passenger door. Underneath the axle, though, the black Labrador puppy pauses, looks around and abandons her mission, scrambling instead toward the tailpipe and out into the sunshine. Purvis quickly hustles her back to the driver's side, and again gives her the command: "Go through!" Tasha drops to her elbows. Purvis runs around the truck, shouting encouragement. "Come on, Tasha! Let's go, girl!" This time, Tasha crawls straight across, causing her owner to explode in praise. Thrilled to have made Purvis so happy, Tasha wriggles the entire back half of her body in delight.

Tasha's teammates soon follow: Jazz, an Australian shepherd; Ranger, a chocolate Lab; and Odie, a mixed breed, each do a flawless truck crawl. Amid hugs, praise, high fives and wagging tails, the dogs and their owners then move on to other events in this doggy Olympics being held just outside Dinosaur National Monument in northwest Colorado. One by one, the dogs politely walk on leash while a human at the other end carries an egg in a spoon. They sit patiently in a beached, rocking canoe while the crazy humans jump in and out. And in a new twist on the wet T-shirt contest, each dog dashes under a large tarp with its owner and, after a flurry of flying canvas and wagging behinds, emerges triumphantly wearing a large, drooly T-shirt that moments earlier had been on the human.

Two dozen onlookers alternately cheer wildly and try to trip up the competition. But Tasha's team proves unbeatable. They trounce three other teams, sending both the dogs and their human handlers into a frenzy that rivals the excitement of the real Olympics.

The games are just one portion of an entire weekend of canine fun. Tasha is also enjoying hikes through the scrubby Colorado desert, sleeping under the stars and mingling with more than a dozen dogs from around the state. How much more fun can a 9-month-old pup have? What Tasha doesn't know, though, is that all her activities have been designed with a deadly serious goal in mind.

Like most of the dogs here, Tasha, Odie and Ranger are search and rescue dogs in training. Soon, these prancing pups will be expected to leave their fireside napping spots at a moment's notice and use their noses to find lost children and adults, track down dead bodies and locate people buried under avalanches or concrete and debris.

Sue Purvis and the other dog handlers know that people will expect a lot from their pets. Some will expect miracles. Sheriffs and tearful parents will count on them to do a job that otherwise could require dozens of people and many, many hours of work. So they have come to this remote corner of Colorado for a training weekend sponsored by Search and Rescue Dogs of Colorado (SARDOC). The humans are practicing moving through the desert guided only by map and compass, the dogs are learning how to track human scent, and both are picking up tricks of the trade from veteran search dogs and their handlers. The session, dubbed a "Confidence Weekend," helps to strengthen the trust between dog and handler, reinforcing the notion that just

At a Colorado training session (clockwise from upper left): Patti Burnett lets Sandy smell a scent article; Steve Howard rewards Odie with a Frisbee game; Tasha rides in a harness, practicing for helicopter pickups; and Zach leads Kristen Berg in a search.

about anything "Mom" or "Dad" asks the dog to do is OK, whether it's fumbling with a T-shirt in the dark during a practice session or riding a chairlift to the top of a ski slope or being hoisted through the air to a noisy helicopter while on a rescue.

Tasha has been in training since she was a mere 11 weeks old. Yet it will be at least another nine months before she is skilled enough to pass the rigorous tests required to become a SARDOC-certified wilderness search and rescue dog. And that is only the beginning. "Wilderness certification is like graduating from high school, the stepping-off point to the rest of the world," explains Wendy Wampler, who owns Jazz. Purvis and Tasha will need to continually practice finding volunteer victims, to be ready to go to work day or night. They might also get specialized training for water or avalanche rescues, cadaver searches and certification by the Federal Emergency Management Agency as an urban disaster search team, the hardest specialty of all.

With lots of practice, Purvis and Tasha might someday be as good at finding lost people as are Wampler and Jazz, who have found numerous individuals in their years of search work. Wampler's favorite rescue, she says, was the time she and Jazz found a 12-year-old girl named Kendra and her dog, who were lost in the mountains near Aspen. While camping with her family, Kendra and her dog failed to return from a solo late-afternoon hike. Searchers from the sheriff's department and other campers were unable to find her, and Wampler and Jazz had been called in at about 3 A.M. Starting at the point where Kendra was last seen, Jazz started following the girl's eight-hour-old trail and, just before dawn, led her handler to the edge of a large field of boulders. "I called out her name again, and this time she responded," recalls Wampler. "I was so relieved." Kendra was cold and wet, but otherwise fine, although she told her rescuers she had panicked earlier and run blindly through the woods, screaming. "But she'd had the presence of mind to keep her dog with her, and she finally sat down and let it keep her warm." Last year, Kendra and her parents came to a dance benefit for SARDOC. In honor of Wampler and her wonderful search dog, they announced, they had named their new puppy Jazz.

Over the Saturday night potluck supper at Dinosaur, the more experienced SARDOC handlers give the newcomers a few tips. Get your dog some earplugs for helicopter rides, they suggest. Always wear cotton so your clothes won't melt in case of fire. They also talk about the traits that can make or break a search dog, including the dreaded "bunny issue." Dogs of all types, from pound mutts to standard poodles, are getting into search work these days, but not all will make the grade. "If your dog chases rabbits and doesn't come right off it when called, you may not have a search dog," warns Kelly Pontbriand, a veteran handler and the coordinator of the weekend's activities. Another handler warns that no matter how much training they receive, some dogs "can't find hamburger in a phone booth." Bunnies and noses aside, many people drop out because they didn't realize that training and maintaining the skills of both dog and handler can require as many as a thousand hours of work a year, no small commitment of time.

Early the next morning, Tasha is preparing to take her first official step toward SARDOC certification—the most basic trailing test, the T1. To get to this point, Purvis and Tasha had started their training with simple hide-and-seek games in the woods near their home in Crested Butte. Tasha, held back by another person, had watched Purvis run off a few times and was encouraged to "go find" her. Once she caught on to that game, she watched one of Purvis' friends run off and found her, then did the same with a stranger. Next, she was faced in the opposite direction while each of those people ran away, forcing her to rely on following the scent left behind. Eventually, to orient Tasha to exactly who she was looking for, Purvis began letting her sniff a scent article, an item of clothing that carries the unique odor of the "victim." Repeated week after week, the

training modifies and strengthens Tasha's natural hunting instinct, turning searches into a job that Tasha will readily carry out whenever she is given the command "go find." Her reward, each time she finds her quarry, is a hearty helping of praise and play with a special toy.

"Tasha knows what the routine is now," Purvis says as she straps the puppy into her work harness. Kamala Mirchandani, another handler, is playing victim. She gives Purvis one of her dirty socks (in a plastic bag to prevent contamination by other scents) and walks off into a stand of stunted evergreens while Tasha looks away. When Mirchandani is about 500 feet away and behind a tree, Purvis gives Tasha a quick snoutful of sock and whispers "go find" in her ear. Tasha takes off like a little black rocket, sniffing the ground and homing in on Mirchandani while Purvis and the test evaluators scramble to keep up. In less than a minute, Tasha finds her quarry. She has passed her T1 with flying colors.

Ranger, who is nearly a year old, is doing his first overnight trail at Dinosaur. A howling wind has pushed around the scent trail that was laid last evening, making Ranger's job more difficult, but when owner Darren Weibler gives him the command, Ranger puts his nose to the ground and does his job. Weibler follows close behind. "Good boy, Ranger. Go find her. Go find." Soon Ranger is just a few feet from the victim, who returned to the end of her trail this morning, but because he is relying solely on his nose, he hasn't detected her yet. No one breathes a word or takes a step, for fear of tipping off Ranger. Just as he was taught, Ranger follows the scent on the ground right to the victim, never once using his eyes. His reward: lots of love and a chance to maul his favorite purple monster toy.

Jenny Paddock paddles while Tika searches from the kayak for signs of a missing victim. Water searches require specialized training for dog and handler.

SUE PURVIS AND DARREN WEIBLER AND THEIR dogs won't be paid even so much as a bowl of kibble for their work. Yet each has decided to commit a significant amount of time, effort and money to search work. "I've finally found my passion in life," explains Purvis. "Nothing is more thrilling to me. This work combines everything: spending time in the woods, spending time with my dog and concern for people." Wendy Wampler says, "If someone's child is lost, we have to find him. That's what I'd want for my child."

It would be nice to think that Tasha and Ranger are also worried about lost children and track them down to save them from peril, just like Lassie always did. But these Labradors are doing nothing more romantic than following trails of dead skin cells. Humans shed tens of thousands of skin cells every minute, leaving behind a sort of invisible bread crumb trail that is very obvious to a dog. Those skin cells, or "rafts," along with sweat and other body secretions, are constantly being broken down into their chemical constituents by bacteria. The gases exuded during those reactions are what give each human a unique scent. As the rafts leave the body, some settle on the ground, while others float on air currents. The odor they give off can percolate through air, water, snow, mud and even porous concrete.

A dog is particularly well suited to detect those scents. Odor molecules that venture inside the snout of a large dog encounter a sea of scent-detecting receptor cells—the tissue area of a German shepherd's nose, for example, is about 17 times larger than that of a human's. Each receptor cell, in addition, has a high number of hair-like cilia, which very efficiently bond with the odor molecules. The molecules arrive, "dock in"

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| Air Filtration | Std. | N/A | Incl. | N/A |
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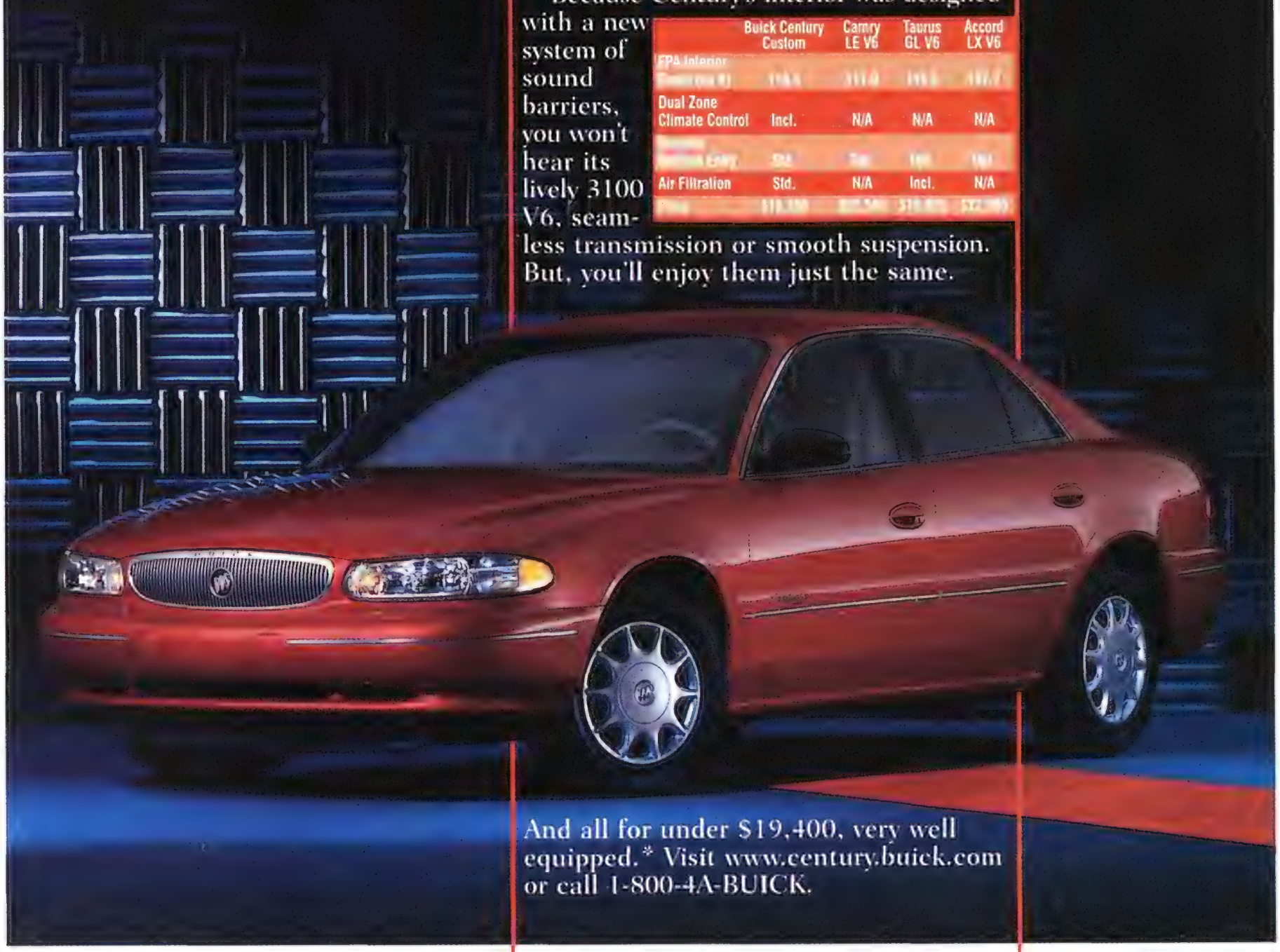

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at the receptors, and the receptors send an electrical signal along nerve pathways to the brain. "Aha! Scent number 4,765!" A dog's sense of smell is probably 1,000 to 10,000 times better than a human's, says Jim Johnston, director of behavioral research at Auburn University's Institute for Biological Detection Systems, where he studies the ability of dogs to detect explosives and drugs.

"For dogs, odors are a more important part of the world than for us," says Johnston. "They get a lot of information from odors—where other dogs have been, where the food is." A dog truly "sees" the world through its nose. Indeed, giving a dog a scent article to sniff is akin to showing a person a photograph.

Most SARDOC search dogs begin their training as Tasha and Ranger did, with nose-to-the-ground trailing. But once they learn the basics of following a scent, they are usually switched to detecting airborne rafts. Air scenting allows a dog to find a victim without having to follow his entire route, and enables it to search a larger area, as much as a square mile. To the untrained eye, it sometimes looks like chaos, as Odie demonstrates at another SARDOC training weekend.

At a Federal Emergency Management Agency test, workers bury a "victim" (top) while a dog works another pile.

On the edge of a grassy field at a Boy Scout camp near Colorado Springs, Odie is listening to his handler, Steve Howard, the Basalt, Colorado, fire chief. "Are we going to find someone?" Howard asks in a high-pitched, excited voice as he straps on Odie's orange search dog vest. "You bet we are! You're a smart dog, aren't you, Odie?" Odie is so excited to be playing the game again that he can barely contain himself. He often gets so excited when working, says Howard, that he can't sit still long enough to eat. Once Odie is suited up, Howard gives him a whiff of a scent article. "Go find 'em!"

Nose high in the air, nostrils wide open, Odie traverses the field perpendicular to the breeze, searching for just the right scent. Within seconds he does his own particular style of "alert"—his tail stops wiggling and stands straight out—which tells Howard that he's found it. He then runs to the edge of the field to see how far the scent stretches. The victim, in a grove of trees upwind, is shedding rafts that, it is theorized, cover a wider and wider area as the wind carries them away, like the wake of a boat. Odie runs back and forth, finding the edges of the wake, or scent cone, all the while moving toward the source of the scent, the victim. His traversing takes him over rocky ledges, through heavy brush and up steep slopes. The wind is particularly squirrelly today, shifting direction every few minutes, pooling the scent in rocky hollows and throwing Odie off track. Howard checks the wind direction with a length of yellow surveyor's tape tied to his finger and gently directs Odie to a spot where the dog will have a better chance of picking up the scent. He won't lead Odie to the victim, but he will help the dog to have a successful training session. Suddenly, Odie lifts his nose higher, makes a hairpin turn, and takes off at a clip to where the victim sits under a tree. He then does a "refind," racing back for Howard and freezing in place when he spots him, as if to say, "I've found the source, Steve! Hurry up and follow me!"

Howard yells, "Show me, Odie! Show me!" and the dog leads him straight to the victim. Odie's reward: a few minutes of play with his favorite ripped-up Frisbee and a ride on Howard's shoulders.

Handlers often comment that they're "the stupid part of the team." It's true, to some extent. The dogs act primarily on instinct, sharpened by training. Handlers must learn to put their own instincts aside sometimes and let the dog do its job. "The biggest problem in training any team is the han-

From a fixed position, Teresa Bluma directs Buster to run from base to base by hand, voice and whistle signals, during a FEMA test in California.

dler," says Andy Rebmann, who once trained police dogs for the Connecticut State Police and now runs search and rescue seminars. "We train the dog to become a reliable tool, then we're always trying to think for the dog, not trusting the dog to do the job it was trained to do." That's not to say that handlers should sit idly by waiting for the dog to do a Lassie. They must plan a search strategy, making sure they cover their assigned area and take into account the strange things that wind, rain, snow, heat and humidity can do to odors. They must watch their dogs constantly, looking for the most subtle alerts. (Not all are as obvious as one standard poodle that Rebmann says jumps several feet in the air.) They must learn how to put together all the pieces of the search puzzle and find the victim as quickly as possible. It can be enormous pressure. Based on what a dog does and how a handler interprets it, search and rescue teams will tear up house foundations, rappel into deep canyons, send divers into murky waters or abandon an area, declaring it cleared of victims.

"I doubt myself every time," says Wendy Wampler, who has been working with search dogs since 1982 and admits to occasionally asking Jazz to find her toddler when he is hiding in the house. "I'm always scared that I'll choose the wrong search strategy and I won't find the victim. That's why I train so hard. It's the only way I can live with myself."

TO THE DISMAY OF SOME PEOPLE, THERE ARE NO national standards for certification of wilderness search and rescue dogs, even though more than 150 groups like SARDOC have sprung up in the past 15 years. SARDOC requirements are among the more rigorous: members progress through three trailing and four air-scenting tests during training, and then must complete three difficult searches, including finding multiple victims and searching at night, to be certified. Handlers are expected to be affiliated with their local search and rescue agency, to be physically fit and to have first aid and wilderness survival skills. After all, searches aren't always conducted in fields of mountain flowers on balmy spring afternoons. A person with Alzheimer's or a cross-country skier is just as likely to be reported missing at 5 P.M. during a snowstorm, leading to a long, cold night of searching. It is not an easy job.

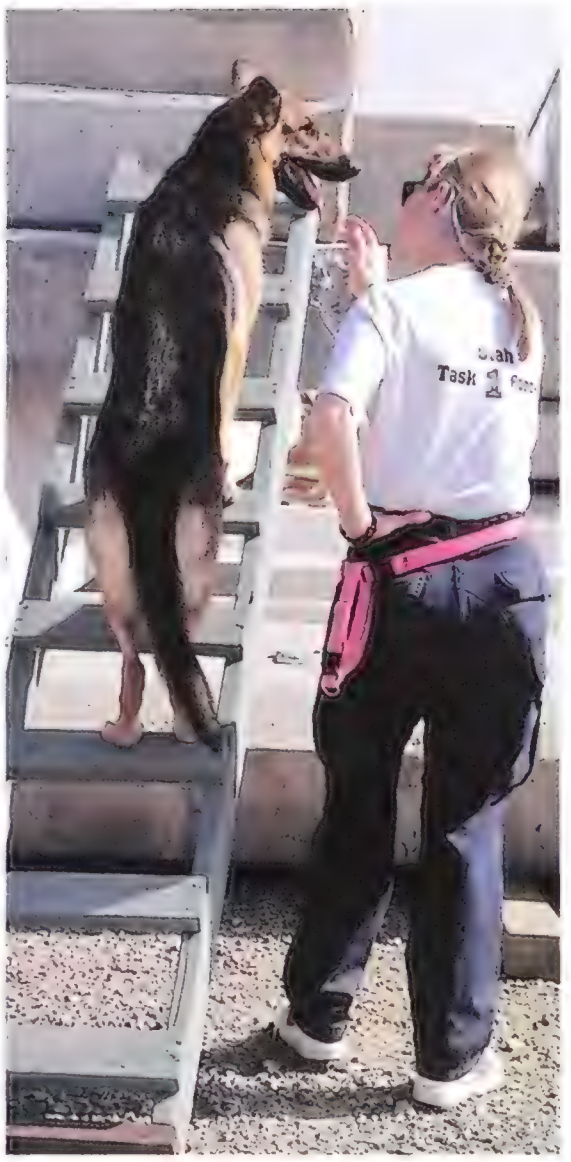
"It's tough to arrange day care at 3 A.M.," says Wampler. "Sometimes, in the middle of a search, I think 'What am I doing out here, I must be out of my mind.' Then, my dog picks up an alert and it's all worthwhile." Wampler and the 21 other certified SARDOC teams respond to about 100 requests for help each year. The most common scenario in Colorado is a lost male hiker or hunter.

Many victims are elderly. Marcia Koenig, a veteran handler from Washington who now runs training seminars with Andy Rebmann, her husband, spent last New Year's Day searching for an 88-year-old woman who had wandered away from a nursing home in a driving rainstorm. Searchers had already spent 18 hours looking for the woman by the time Koenig and her German shepherd, Coyote, were asked to help. "I gave Coyote a scent article and she found her within ten minutes," says Koenig. "She was less than a quarter-mile from the home, but she was lying down, concealed in some bushes. I yelled 'Good dog!' to Coyote, and then ran to the woman. Thank God, she was still alive," sighs Koenig. "There's nothing better than a live find."

Many SARDOC teams, such as Carla Tomaszczyk of Aspen and her standard poodle, Cassidy, take specialized search training. Cassidy is a certified avalanche rescue dog, skilled at finding bodies—dead or alive—buried under snow. At least once a week in winter, Tomaszczyk and Cassidy head for the hills for a practice search. Today they hop on a chairlift and ride to the top of the Snowmass ski area. At the top of the lift, 11,835 feet up, Cassidy warms her toes in the ski patrol hut while Tomaszczyk and other handlers wear themselves out chopping up 10,000-square-foot fields of snow to resemble the chunky blocks left by an avalanche. They then dig large, L-shaped chutes five feet deep in the snow. A ski patroller is conscripted to drop into the chute and lie in

the coffin-like tunnel at the bottom, and the chute is filled in with snow.

In this session, two ski patrol members have been buried in a section Tomaszczyk did not dig, so neither she nor Cassidy knows where they are. Fifteen minutes after burial, their scents have had ample time to rise through the snow and the search begins. "Go find, Cass, go find!" Cassidy bounds across the snowfield, her bright orange vest the only contrast to white hair on white snow. She knows her job is to find any human scent coming from under the surface. Within seconds, she thrusts her nose into the snow at a point that looks no different from any other and starts digging. "That's an alert," declares Tomaszczyk. "Where's the other one, Cass? Let's go find 'em." Cassidy dances across the snow and almost immediately begins digging. Right again. It seems the burial spots couldn't have been more obvious to her if they'd had neon arrows pointing to them. In less than a minute, Cassidy has found both victims. It would have taken 30 people 30 hours of delicate probing to find any victims on a snowfield of that size, by which time they would have been long dead.



Nancy Hachmeister coaxes Ivey to climb up a ladder. The dog passed on another try.

BECAUSE NOT ALL LOST PERSONS ARE FOUND alive, Tomaszczyk and Cassidy attended a three-day course in cadaver searches. Handlers from around the country listened to Rebmann and Koenig talk about the finer points of finding dead bodies while 15 dogs rubbed noses and snoozed under the meeting room tables. Showing graphic slides, they discussed the nuances of decomposing bodies, how serial killers hide bodies and how to train your dog to find such things. Cadaver search work is different, Rebmann explained, because dead bodies all smell alike. No scent articles are needed. Instead, the dogs learn to search for a characteristic cadaver odor and a special command that means "find dead people." Some use "Find the baby," others, the more palatable "Find Fred."

The students are trained using Pseudo Corpse, an odoriferous substance made by Sigma Chemical Company just for training search and rescue dogs. In a hotel parking lot, Cassidy and the other dogs lined up to get a good whiff of the chemical, then took turns finding it when it was hidden in one of several concrete blocks. "We're not training the dogs to find bodies," Rebmann explained. "We're training the dogs to find scent." Cassidy obviously learned her lesson well. When visiting family in Indiana last year, Tomaszczyk and Cassidy were called out to look for victims of a serial killer who, as it turned out, liked to bury bodies in his yard. Based on her training with Pseudo Corpse, Cassidy easily pointed the way to human remains.

Of all the search and rescue dogs now working in the United States, only 73 have gone on to be certified as either a basic or an advanced "disaster dog" by the Federal Emergency Management Agency (FEMA). It's a relatively new specialty. Some handlers say they are reluctant to expose their pets to the dangers of searching in urban disasters, such as the aftermath of an earthquake, although few of the dogs that worked at the site of the Oklahoma City bombing sustained any injuries. (The handlers did not fare as well. Of the 50 who responded to a survey, 16 have since left search and rescue work due to the emotional impact of that event. None of the FEMA-certified teams have dropped out, however.)

FEMA training is tough. Not only must the dog know basic scenting techniques, it must also know how to move safely in a chaotic scene full of potentially fatal hazards. At a basic FEMA test held on a back lot at the Ontario, California, airport, ten dogs from around the country are attempting to earn certification. Most of them have easily passed several parts of the test, including a long stay, a drop on command, scent detection and verbal directional control (in which a dog runs the bases on command from a handler who cannot venture beyond home plate). The agility test, however, which determines if a dog is ready to pick its way safely foot by foot through a collapsed building or train wreck, is not so easy.

Ivey, a German shepherd belonging to Nancy Hachmeister, has successfully completed the test's early stages but is balking at climbing a ladder. She climbs a few rungs and stops, quietly whimpering. Hachmeister talks to her in a low voice, "Come on, honey, go. You're not doing this very well, honey." Ivey eventually climbs the ladder, but then refuses to go on to the next step, insisting on going right back to the ground. Hachmeister is not discouraged by Ivey's failure. They'll take the test again.

"You die a slow death as an evaluator, watching a dog fail," notes an experienced handler who is judging the test.

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"But really, failing is not so much failing as it is just a part of the process toward certification."

Sunny, a 95-pound Doberman pinscher sometimes called the "search pony," trembles as he climbs the ladder, guided by his 105-pound owner, Shirley Hammond. He is a bit more confident on the seesaw, walking up the plank, balancing just beyond the fulcrum while the upper portion sinks to the ground, and slowly picking his way back down. He breezes his way through the tunnel crawl and across an unsteady pile of sheet metal and chain-link fencing.

The final part of the exam is the rubble pile. Only five of the dogs have done well enough to advance to this stage. Three evaluators in full safety gear are perched on top of a 15-foot-high pile of concrete and twisted steel, and one victim has been hidden inside a concrete tube. Shouting commands from a fixed position on the ground, each handler sends his or her dog up to find the victim. Each team has just ten minutes. While two-dozen people watch in silence, Sunny carefully picks his way across the rubble, slowing a bit when crossing a shaky wooden pallet. After a few minutes of sniffing around, he stops. He lets out a bark and a long, plaintive howl. Another bark, a longer howl. Everyone holds their breath. Finally, Sunny lets loose with several short barks, the repetitive noisy alert that is required for urban disaster work. He has found his victim. The evaluators declare him a certified FEMA dog, one of only three animals to pass today.

When the results are announced, everyone, including those who didn't pass, gives the three teams a standing ovation. Then all begin the long drive back to homes and day jobs, to practice some more and wait to be called.

The next morning, another eight dogs gather to attempt the even more difficult advanced FEMA test. This time, six victims have been scattered among three large rubble piles, along with scent-laden clothing, noisy generators and other distractions. A. J. Frank, a firefighter from Seattle, and his 4-year-old chocolate Lab, Ohlin, approach the first site. The scenario: a two-story senior-citizen complex has collapsed. Wearing a bright orange jumpsuit and hard hat, Frank asks several questions about the potential number of victims and any known chemical or electrical hazards. He then sends Ohlin scrambling to the top of the pile, searching for the scent of victims. "Are you a search dog?" he calls when the dog reaches the top and looks back for guidance. "Go search!" Frank continues shouting directions at Ohlin from the ground until they have found two victims, and Frank figures they have covered the entire pile. At a debriefing, Frank draws a map of the pile and the probable locations of victims, while Ohlin wiggles his ears at flies and plays with his reward, a deflated soccer ball.

By the end of the exam, Frank and Ohlin have found only four of the six victims, not enough to pass. For a while Frank, who has been laughing and joking all day, walks with his eyes downcast, his step noticeably slower than before. But he isn't giving up, he says, brightening. He'll be back.

*Catherine Dold is an ex-New Yorker living in Colorado. Scott Warren is delighted so many dogs make the Rockies a safer place.*

**Cody, a Border collie, has now been certified by FEMA as one of the few advanced disaster rescue dogs. Training will continue, however.**

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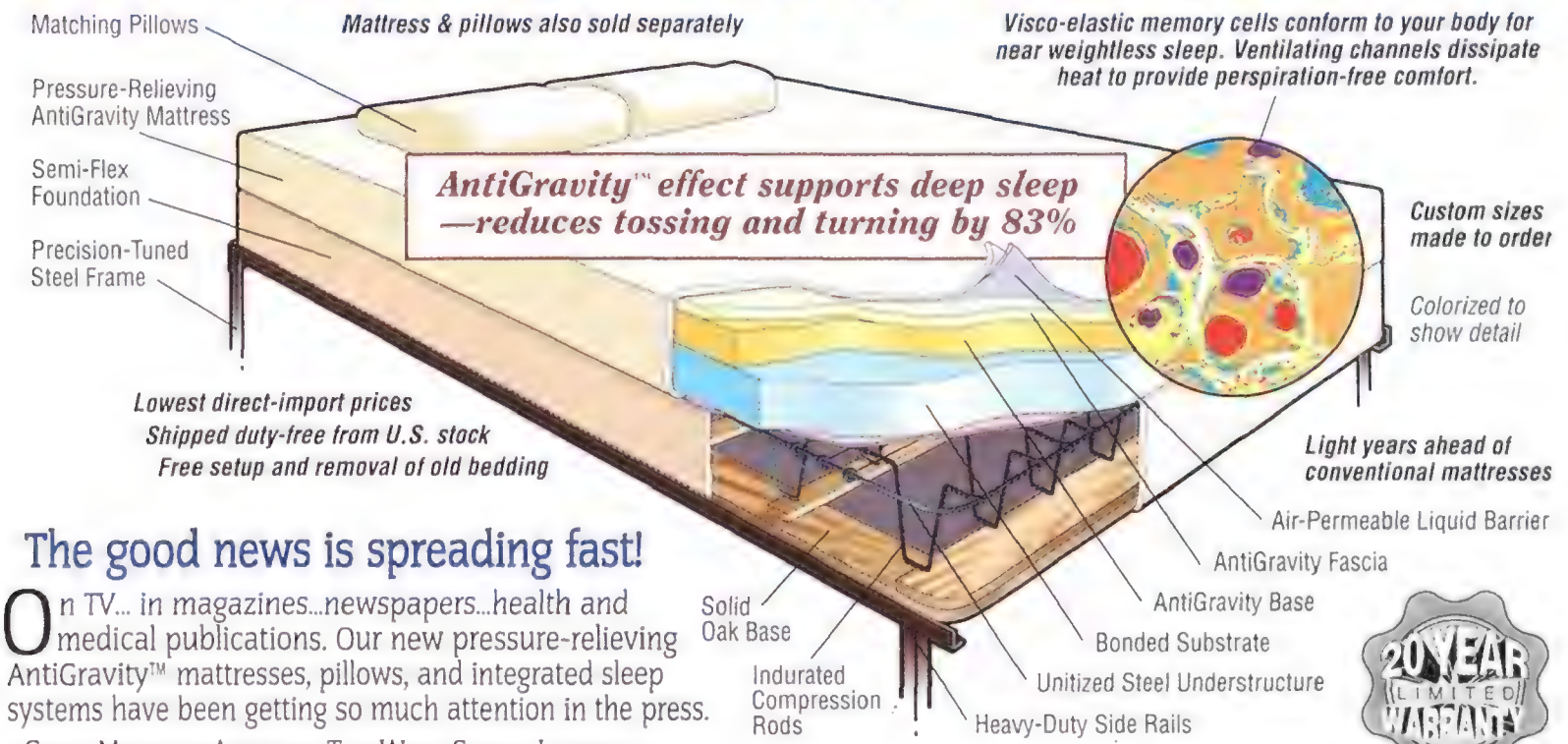
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At the only remaining active part of the Bethlehem Steel plant a forge worker trims a massive ingot with a gas torch.

# SAVING AMERICAN STEEL

BY DOUG STEWART

PHOTOGRAPHS BY JOSEPH ELLIOTT

AS THE GIANT MILLS OF THE RUST BELT FALL SILENT, A MOVE IS AFOOT TO PRESERVE THEM

ELMA BELL USED TO HATE SLOSS FURNACES. A LANDMARK OF THE BIRMINGHAM, Alabama, skyline for more than a century, the clamorous, smoke-and-flame-belching complex burned night and day to smelt iron until it closed down in 1970. Bell was one of many citizens who viewed the abandoned structures as evil-looking eyesores that were best torn down. Her attitude was shaped in part by the childhood memory of being dragged there by her grandmother when the plant was still in blast. For those who misbehaved, her grandmother warned, this was what hell would be like.

Not everyone in Birmingham thought the blast furnaces unsightly. When demolition plans were announced in the late 1970s, Birmingham's citizens surprised the experts by voting to preserve the site as a symbol of the city's roots as an industrial boomtown. Elma Bell, by then a reporter for the *Birmingham News*, was still skeptical until the director of the museum-in-the-making led her up onto the catwalk of a gas-washer. Looking out at the monumental furnaces, stoves and smokestacks where a mountain's worth of rock had been turned into molten iron, she wrote, "the magic of the place finally hit me. Tear down those majestic structures? That is the silliest idea I ever heard."

Sloss Furnaces is the exception, not the rule. Industry exists to make money, and most industrial structures are torn down, or drastically altered, once they no longer do so. Few of us lament their passing—our protective impulses are more apt to be aroused by Colonial mansions or Civil War battlefields. Yet a growing number of civic leaders, preservationists and industrial-history buffs are working, sometimes frantically, to preserve the physical traces of the United States' rise to industrial supremacy in the late 19th and early 20th centuries. None of these relics are in more danger of extinction than those of the traditional iron and steel industry, once the engine of American global might.

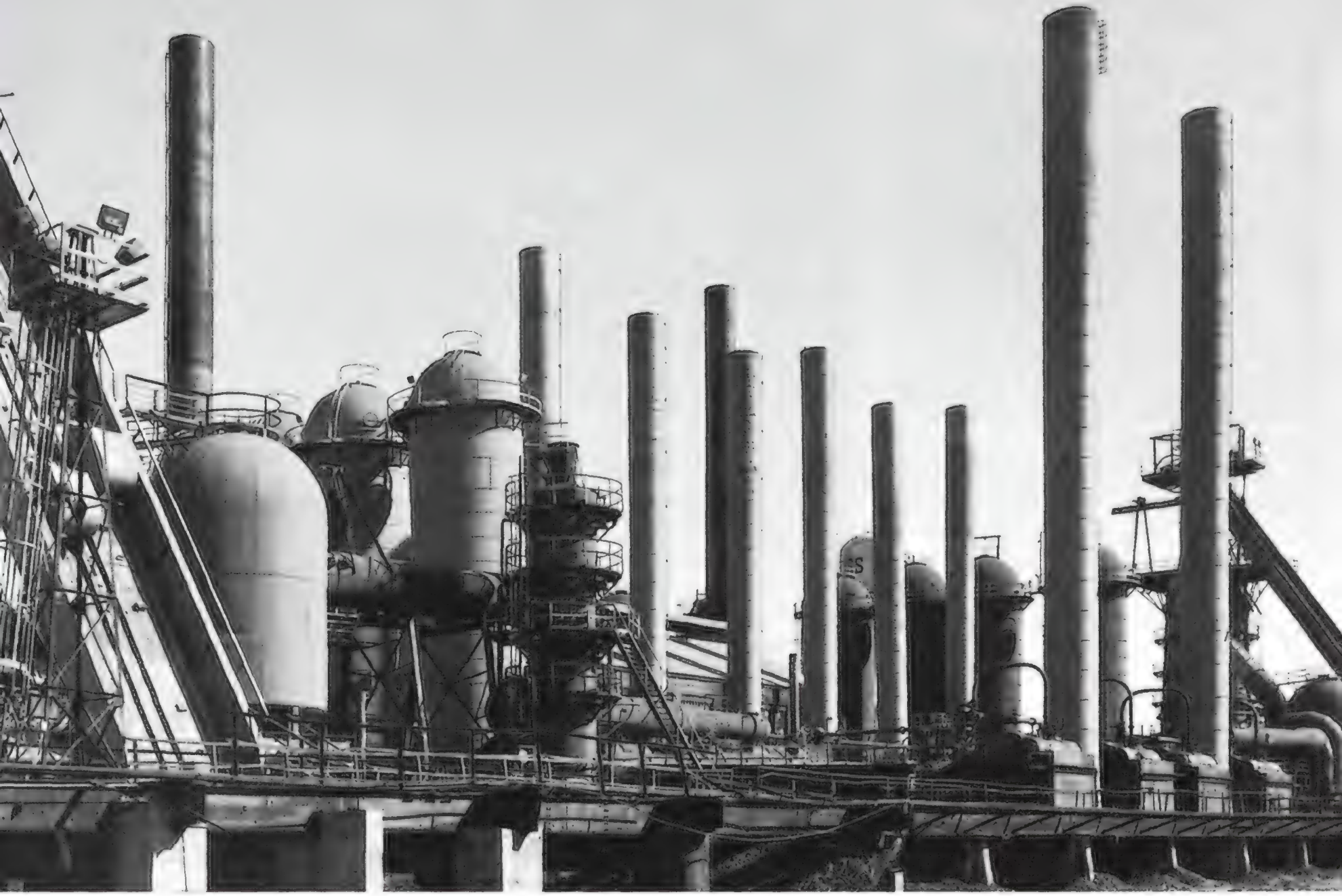
"One of the major themes of the Industrial Revolution in this country is the production of iron, and later, steel," says Emory Kemp, director of West Virginia University's Institute for the History of Technology and Industrial Archaeology. "It's essential to understanding our history." Unless important remnants of these processes are saved, he warns, "our knowledge of the way this was done is simply going to disappear, leaving only those interested in digging into archives to have any understanding of what this industry was all about—its scale and its importance, not only in technical history but in social history."

Efforts to save at least one historic steel mill received a dramatic and unexpected boost in February, when the Smithsonian Institution and Bethlehem Steel Corporation announced tentative plans for a huge new undertaking, the National Museum of Industrial History. The 160,000-square-foot museum would be situated in the heart of the once-mighty Bethlehem Steel plant in Bethlehem, Pennsylvania. The steel company would provide the land and buildings; the Smithsonian would provide a collection of industrial artifacts (on long-term loan) and curatorial expertise. A campaign aimed at private and public sources would raise the estimated $60 million needed for the project.

"The Smithsonian holds more than 140 million objects in trust for the American people," Smithsonian Secretary I. Michael Heyman noted at the press conference announcing the plans. "I want them to see these treasures where they live, not just in our museums."

No site in the country is a more fitting backdrop for a display of American industrial prowess than the mammoth steel plant in Bethlehem, Pennsylvania. Set among rolling hills, "the Steel" stretches for nearly five unbroken miles along the fast-moving Lehigh River. For most of this century, the plant's signature products were wide-flange beams, massive pieces of structural steel that made possible skyscrapers and long-span bridges. The company liked to say that if all the Bethlehem steel propping up New York City were removed, two-thirds of the city would collapse.

By the 1990s, the Bethlehem steelworks, like so many others, had become an industrial dinosaur, a victim of technical obsolescence and foreign competition. Most of the plant was shut down within the past two years, though the company continues to make steel elsewhere. The Smithsonian's interest may rescue at least a part of the plant from the usual fate of old steel mills, which is to be knocked down and "harvested" for scrap metal (SMITHSONIAN, May 1997).



Sloss Furnaces' arresting towers and blast furnaces are now preserved as a much-loved industrial museum. For 100 years, the Birmingham, Alabama, plant burned night and day to smelt iron.

Visiting the complex, I find myself in the midst of an eerie, depopulated city of rusting blast furnaces, immobile lines of dented railway cars and brick buildings larger than Carnegie Hall. At the close of World War II, more than 30,000 people worked in the furnaces, rolling mills, foundries, machine shops, ore depots, engine houses, railroad yards and coke ovens here. Now it's a virtual ghost town. Building after building is silent except for the ubiquitous hiss of steam pipes; the steam is still being used to generate electricity.

Wearing a pin-striped suit and a hard hat, Charlie Martin shows me around. Martin is the site's remaining plant engineer. We step into one of the three turn-of-the-century mill buildings that could house the new museum. "If you want to show the massive things of the past," Martin says, "it takes a building like this to do it." The structure is close to 900 feet long with rows of cast-iron columns on each side as endless as a reflection in a house of mirrors. Among the candidates for display here, according to the Smithsonian, are an 1875 Otis elevator, a selection of historic steam engines and diesel locomotives, a power generator from the nation's first electrical plant at Niagara Falls, plus mining lamps, typewriters, union badges and a photographic archive.

Though the company will never pour steel here again, or even preserve all of the structures now standing, it might coax some of its huge machines into motion as a tourist attraction. To show me an example, Martin takes me into the Grey Mill, home of the wide-flange jumbo beam. In the dimness, I look up at a massive steam engine that powered the rolling mill here until the mill went cold in October 1995.

*"When you shut down a plant like this, you lose the whole industrial culture that went with it."*

Nearby I see a mountain of dusty pipes, gears, shafts and what appear to be fire escapes, the whole suggesting a collapsed building. "That's a 1906 universal rolling mill," Martin informs me. Until just two years ago, this antique contraption shaped ingots of red-hot steel by squeezing them repeatedly between pairs of rollers, a bit like wet laundry run through a wringer. Out of this configuration came steel for the Golden Gate Bridge.

After touring the plant, I rendezvous with local steel-industry buff Lance Metz, who works as a historian at the National Canal Museum in nearby Easton. Metz has been rescuing obsolete mill artifacts and records since the early 1980s. "When you shut down a plant like this," he says, "you don't just lose the glamorous 'hot end' of the steelmaking process. You lose the whole industrial culture that went with it." That's why he's salvaged everything from security badges to time cards.

The prize of the collection is the battleship *Mississippi*'s 180,000-pound, 14-inch cannon, built from scratch here in 1917 and recently retrieved from a naval base in Virginia. "It's a symbol of what Bethlehem Steel was all about," Metz says, noting that the company owned a string of shipyards as well as steel mills. "In both world wars, this was the most important defense plant in the whole Allied war effort." Metz isn't sure what a museum can do with a 60-foot-long cannon, but he has no doubt that such souvenirs of steel will draw a flood of tourists to Bethlehem. "We're a little over an hour from both New York City and Philadelphia. More than ten million people live within an hour's drive of here."

Metz is unswervingly optimistic about the box-office potential of Rust Belt memorabilia, but not everyone in the area shares his rosy view. Before leaving town, I visit a Catholic cemetery on a hillside next to the First Hungarian Lutheran Church, which overlooks the row houses of East Fourth Street. Directly behind them, the plant's towering blast furnaces erupt like a dark volcanic ridge from the city's south side. I ask a man repairing toppled gravestones what he thinks of turning a portion of the steelworks into a museum.

"I'd rather see smoke flying out of those smokestacks," says Jay Dalrymple, a former steelworker. "Wouldn't it be better to modernize the thing and put people back to work?"

Unfortunately, it's too late for that. Big Steel has collapsed; tourism is now Pennsylvania's second-biggest industry. Civic leaders in industrial towns throughout the Rust Belt are hoping that the growth of so-called heritage tourism will help revive devastated economies.

The blue-collar city of Johnstown, Pennsylvania, was particularly hard hit when the local steel mills began downsizing about 20 years ago. The National Park Service (NPS) was then converting a massive 19th-century textile mill in Lowell, Massachusetts, into the nation's first major urban industrial heritage park. Local boosters in Johnstown tried to interest the NPS in some of the city's historic steel mills, too. The plan eventually fell through, recalls Richard Burkert, executive director of the Johnstown Area Heritage Association. Burkert remembers seeing the NPS director "visibly shudder" when he saw the size of Johnstown's many empty mill buildings.

Just preserving a full-sized steel mill, much less turning it into a museum, would be "ludicrously expensive," Burkert admits when I pay a visit to Johnstown. Instead, he and other local planners, like their counterparts in Bethlehem, envisage a scaled-down, self-sustaining tourist-mecca-cum-industrial park. Most of the nine mill buildings in question, once part of the Cambria Iron Company, are owned by the Bethlehem Steel Corporation but have stood empty for several years. The site is a National Historic Landmark.

"There's no site left in the United States that can tell the entire steel story," Burkert says as we drive past mill after empty mill. "What you have is fragments." Burkert is a broad-shouldered, low-key historian who originally came to this rugged corner of Pennsylvania to work at the Johnstown Flood Museum. He's since become a walking encyclopedia of steel history. Cambria, he says, is significant as one of the more intact steelmaking sites left from the 19th century. As late as the Civil War, steel was an expensive commodity made by artisans with hand tools for use in products like scissors, springs and swords. The Cambria Iron Company pioneered new ways to scale up the production of steel rails; and in 1876 it was the country's top steel rail producer.

Many of Cambria's buildings have now been torn down, but what's left is still impressive, even stylish by steel-mill standards. I notice a shop with a mansard roof, another with a half-timber facade. The architectural centerpiece is the blacksmith shop, an 1864 brick octagon. "The blacksmiths here didn't make horseshoes," Burkert says as we step inside and wait for our eyes to adjust to the dark. "They made the tools and the equipment needed to make iron and steel." Around us in the gloom are small ovens and an old forge, its steam hammer poised ominously over a large anvil.

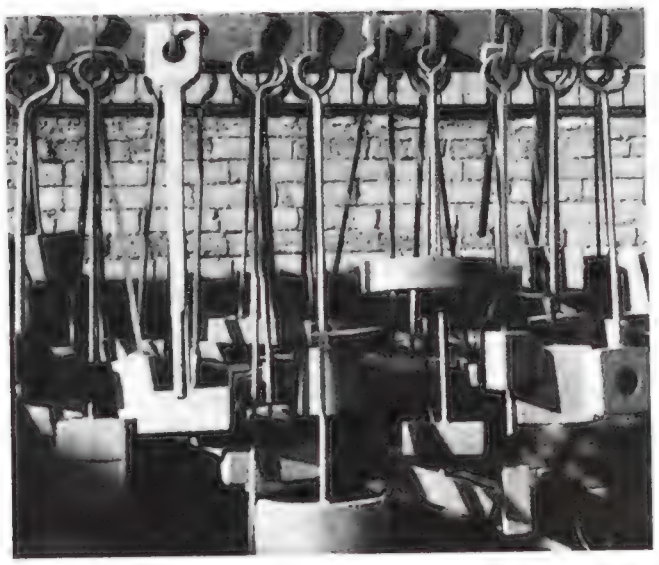
The blacksmith shop appears ancient but was used until five years ago. Had it been idle much longer, Burkert says, it wouldn't be here; the scrap metal would have been melted down to make new steel. In years past, Burkert has had some of the retired blacksmiths demonstrate their high-decibel craft here for tourists, but he now has grander plans. In the gargantuan 1906 machine shop nearby he'd like to see a wide-screen movie theater featuring archival footage of steelmaking in action.

But Burkert is aware that even 70-millimeter film is no

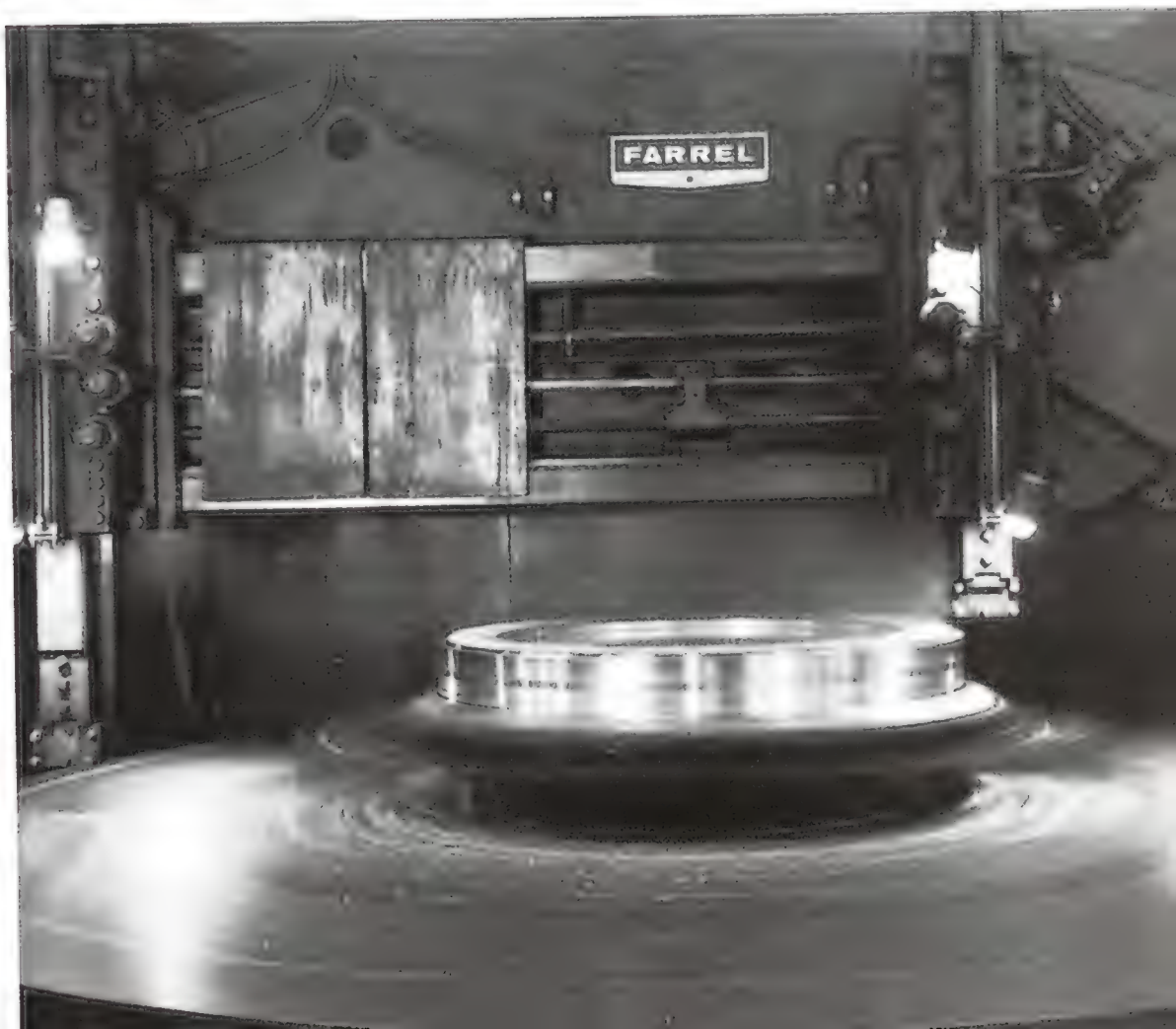
In 1995, workers at Pennsylvania's Bethlehem Steel still used an age-old system of baskets and locked cables to stow personal gear overhead in their "welfare room."

These handmade planes and shapers were designed by one of Bethlehem Steel's pattern-makers, Edward Sajt, to help keep the aging plant and its machinery in good repair.

At the Bethlehem machine shop, a 15-foot-wide steel disk turns on a huge table as a cutting assembly moves up, down and sideways, shaping it to precise specifications.



Late afternoon sun plays across a collection of hammer gauges hanging outside the blacksmith shop at Johnstown, Pennsylvania's Cambria Iron Company.



A line of railcars sits idle beside the snow-covered rooftops of the vacant mill buildings at the Bethlehem Steel plant. The proposed National Museum of Industrial History could revive the site.

substitute for the real thing, so we drive a few miles upriver to the Franklin Works. Occupying close to a million square feet, Franklin is the largest of the four mills that Bethlehem Steel ran in Johnstown until it stopped production there five years ago. A company called Bar Technologies has leased a fraction of it and began making steel last summer. Bar Tech is a minimill that specializes in a stripped-down version of steelmaking; it buys scrap and melts it in electric-arc furnaces. These furnaces aren't as dramatic as the old open-hearth furnaces, which were like rows of houses on fire. But they're dramatic enough.

Standing in the dark interior of Bar Tech's mill, we watch from a distance of 60 feet as electrodes begin sending a high-voltage surge through 170 tons of old car parts and other scrap packed inside the cauldron-shaped furnace. The hum of electrified steel is deafening. Above the sound, the furnace begins rattling like a popcorn popper—impurities in the scrap are exploding. Sparks shoot past us, and the mill's vast interior is quickly hidden in smoke. Flames roar out of the furnace's openings. I'm impressed.

"Don't stare at molten steel. It'll hurt your eyes," shouts engineer John Schnabel, handing me a pair of blue-tinted glasses. We watch as the furnace slowly tips and a cascade of flaming white liquid splashes into a ladle in a pit below us. Looking down into the 3,000-degree churning, white molten metal, I'm having trouble accepting that what I'm seeing is real, let alone routine.

If Richard Burkert has his way, visits like these would be a standard part of the Johnstown tourist experience. For a change of pace, we stop at the J. Pitt Steel Company's rolling mill, nearby. Here steel has been rolled by hand for 103 years and counting. I watch in amazement as groups of men wearing blue jeans and T-shirts grapple with red-hot steel billets using handheld tongs. Scuffling and sliding on the steel-plate floor, they grab the billets as they come through the rollers, then fling them back the other way. Like cookie dough, the billets grow longer and thinner with each pass. A local group, the Open-Hearth Education Project, has begun organizing tours of the mill using unemployed steelworkers as guides.

Larry Williamson, director of Pennsylvania's recreation and conservation bureau, believes the public needs to be reeducated so they don't automatically pile into the car and head for the Grand Canyon. "These huge industrial sites are *our* Grand Canyons," he says.

But how can a cold mill ever convey the clamor, the grit, the chaos and the danger of a hot one? Even a modern work-

Former steelworker Rich Majorsky strides across a vacant Pennsylvania field that was once the site of U.S. Steel's Homestead Works. "We built the United States right here," he says.

ing steel mill is a hazardous place. Planners are trying to come up with tourist-friendly alternatives, such as a refurbished rolling mill that squeezes lumps of putty instead of steel. At the old Carrie Blast Furnaces on the Monongahela River outside Pittsburgh, exhibit designers propose nightly "thunder and light" shows with film footage of smoke and flames projected onto a curtain of steam.

Steve Lubar, chairman of the Division of the History of Technology at the Smithsonian's National Museum of American History, says he's in favor of adding a little pizzazz to preservation. "It's important to make steelmaking come alive so that people understand what it was like to work inside one of these buildings. Steel mills were full of fire and heat and action. Empty mills are the exact opposite. If you're just trying to preserve one as a rusting hulk, I'm not sure it's worth doing."

Augie Carlino would agree, but he wouldn't mind having at least one rusting hulk of a mill left to preserve. Carlino is executive director of the Steel Industry Heritage Corporation (SIHC), a private nonprofit group based in Homestead, Pennsylvania. Fifty years ago, 80,000 steelworkers had jobs in mills up and down the Monongahela Valley; by 1990 fewer than 4,000 did. With Big Steel gone, the SIHC is overseeing the creation of the Rivers of Steel National Heritage Area, a scheme that Congress last fall authorized as part of an omnibus parks bill. The proposed heritage area is a loose-knit collection of industrial communities, historic sites, parks, museums and other attractions. Its spiritual heart is the legendary Homestead Works, producer of steel for the Empire State Building and the Sears Tower.

When U.S. Steel closed the plant in the early 1980s, it was a sprawling complex of buildings old and new—"a visual history of the steel industry," in the words of NPS historian Gray Fitzsimons. Not so today. The plant has been sold for scrap. Now, standing on the edge of the 550-acre site, I see a brown wasteland as featureless as a ballpark's raked infield.

"You'd never know there was a steel mill here," Augie Carlino admits. He points out the few structures that remain. Standing as forlorn as a gas pump in the desert is Homestead's mighty 12,000-ton forging press, which shaped armor plate for generations of battleships. Close by, a small brick pump house marks the site of the bloody Battle of Homestead, in which two barge-loads of union-busting Pinkerton guards were met in July 1892 by furious steelworkers armed with clubs, rifles, flaming oil and dynamite. "They even had a cannon left over from the Civil War," Carlino says. "It was crazy!"

He makes no pretense of neutrality. Homestead is a blue-collar, highly politicized town, and Carlino, a bear-like Democrat-by-birth, is pro-union all the way. He could easily be mistaken for a steelworker, though he's a former Congressional aide and Washington lobbyist.

Carlino is resolutely upbeat about plans for restoring the existing structures and building new ones to house exhibits. The centerpiece would be a massive steam-powered rolling mill that his group rescued, disassembled and hauled away for safekeeping. Its numbered pieces, all 1,200 tons of them, are laid out in a grid in an empty factory not far away. Like the museum builders in Bethlehem, Carlino intends to see at least part of the machine chug again. He imagines tourists arriving by riverboat to shop, dine, see simulations of steelmaking and learn a little labor history, Homestead-style.

Even with the steelworks gone, reminders of past glories are everywhere in the Homestead area, from the stainless-steel domes of the churches to Munhall's statue of St. Joseph the Worker, standing on a globe and pouring steel from a handheld ladle. The community's polyglot population is itself a legacy of the mill, when immigrants flocked here to tend the furnaces; "Danger" signs in the plant were posted in 13 languages. The SIHC wants to work the area's many ethnic churches and festivals into future tourist itineraries.

SIHC folklorist Doris Dyen makes clear that preserving the heritage of Big Steel goes beyond saving mill technology. "People built this industry. It didn't build itself," she says. Her archive includes not only oral histories and photographs but a collection of steel-industry folk art, from scrap-metal sculptures to decorated hard hats.

Dominating one wall of the SIHC office is a poster made from an old illustrated postcard. It depicts the Homestead Works at night, with railroad cars dumping hot slag like lava as sparks rocket into the sky. "At night this was a gorgeous city," says executive secretary Mary Lou Calcaterra as I admire the artwork. "The sky would be lit up in reds and yellows for miles around. There was a lot of beauty to steel."

Several former steelworkers drop by, and when I ask about famous structures they might have made steel for, it

becomes clear they find the question a little foolish. The steel they made is everywhere. "We built the United States right here!" Rich Majorsky shouts.

All of them want to see Homestead commemorated, and each cites a personal reason for doing so. "I worked 42 years in a mill that was never electrified," says Leonard Fleming. "It was all steam-driven. That to me is history, and my grandchildren aren't going to know anything about it. But how do you preserve something that isn't here anymore?"

That's a problem that Jim Burnham, director of Alabama's Sloss Furnaces, is happy he doesn't face. (Burnham retired from Sloss this July.) Compared with the old Homestead Works, the Sloss Furnaces site in Birmingham is manageably compact, which helped it survive demolition after going cold 27 years ago. In a large steel mill, the massive blast furnaces convert iron ore into iron, the main ingredient for the steelmaking furnaces. At a stand-alone site like Sloss Furnaces, however, iron is the finished product, sold in molded chunks called pigs. The original furnaces were built in the 1880s; the existing structures date from the 1920s and '30s. Now a city-owned museum, the site was designated a National Historic Landmark in 1981.

"If this place were any bigger, it couldn't have been saved," Burnham tells me as he shows me around the site. "As it is, you have to pour money into these structures just to stabilize them." Burnham, a serious, professorial man, is a transplant from Michigan, where he was chief conservator at the Henry Ford Museum in Dearborn, but he's as boosterish as any native son. "These are the only 20th-century blast furnaces in public hands, preserved as a museum, in North America," he says as I peer up at one of them, a tapered, brick-lined steel tower some 70 feet high. It's ringed by catwalks, pipes and paraphernalia worthy of a NASA launch gantry. As pure architecture, it's an arresting sight, serene and monumental against a clear blue sky. I have to remind myself that once this was a man-made volcano issuing black smoke and flaming metal 24 hours a day.

We step inside the nearby blowing-engine house, where eight enormous steam-powered engines loom over us in a silent row. These supplied the continuous blast of air that fed combustion inside the two blast furnaces. The sheer volume of metal around me is impressive. Each engine's flywheel is 22 feet across, and tangles of pipes and ducts swarm over everything. "The scale, the weight and the girth of everything here are very different from what you normally find in a museum," Burnham says as I try in vain to move a flywheel.

Outside, I notice a bouquet of daisies perched incongruously on a ledge at the base of Furnace No. 2—a leftover from a weekend brewery party, Burnham explains. Birmingham's citizens take almost perverse pride in Sloss Furnaces' "heavy metal" ambiance, he says. "It's got a flavor people can't find anyplace else." The furnaces, in fact, have become one of the city's cultural gathering places. A casting shed has been converted to an open-air amphitheater for

*We stop at the J. Pitt Steel Company. Here steel has been rolled by hand for 103 years and counting. I watch as groups of men grapple with red-hot steel billets using handheld tongs.*

symphony concerts and the annual Birmingham Jam, a three-day festival of gospel, blues and jazz.

I smell something burning, and we trace the odor to a flaming oil drum behind Furnace No. 1, which is surrounded by a half-dozen men clothed in protective coats. These are the Sloss artists in residence; the oil drum is used as a miniature blast furnace. A pile of broken cast-iron radiators serves as raw material. Using a handheld tool, a man in a leather apron and wire-screen mask skims slag from the top of the furnace and lets it splash onto the sandy ground in a burst of sparks. Two other masked men grab the handles on a small ladle and struggle over to a row of molds that schoolchildren have created as part of an ongoing art project. Flames erupt from the molds as they pour. Ingot, the foundry dog, watches impassively from a distance.

It's vulcanism on a small scale, to be sure, but the flaming iron is as hot as it ever was. "This personalizes the experience of iron-making for people who come here," Burnham says as we watch the red-hot metal begin to speckle, then turn solid gray. "For people in our metal-arts classes, it can be almost a spiritual process—they turn rock into metal and make something new with it."

His protective gear hung nearby, a worker took a break between tappings at Bethlehem Steel's D blast furnace. The furnace closed for good in 1994.

Few of the people who worked at Sloss in its heyday, most of them African-Americans, likely found anything spiritually uplifting about their jobs, Burnham adds. He points out a tiny shotgun shack awaiting restoration, the first of several. The plant was once surrounded by hundreds of shacks like this, he explains, all of them company-owned. "The houses of each ethnic group had their own color," he says. "It was all rigidly segregated." The museum plans to re-create a block of worker housing, complete with gardens, a small restaurant and a residence for a visiting artist.

Burnham recently traveled to Germany, where preservationists have followed Sloss' example on a grander scale, thanks to lavish public spending. "At Duisburg, you see rock climbers scaling the walls of the ore bunkers," he says. A scuba-diving school has set up shop in the water tanks.

But, without heroic amounts of money, it's unlikely that any obsolete steel mill will ever be preserved intact. Yet the grit and hard-edged power of such a place offers an invigorating contrast to the growing vicariousness of our own daily lives, filled as they are with push buttons, plastic keyboards and simulated realities.

"As places like big steel mills get more remote from people's personal experiences, they're going to become more and more attractive," says steel-industry historian and museum consultant Tom Leary of Industrial Research Associates in Buffalo. "In 100 years, people are going to flock to see these places, in the same way that if a dinosaur was walking down the street today, you'd rush outside to see it."

*Doug Stewart, a regular contributor, now appreciates the beauty of old steel mills. Joseph Elliott, associate professor at Muhlenberg College, in Allentown, Pennsylvania, makes his* SMITHSONIAN *debut.*

BY SUKI CASANAVE

# Tree Houses

IT USED TO BE KID STUFF, BUT THESE DAYS MORE AND MORE ADULTS ARE BUILDING IN TREES TO GET HIGH

I REMEMBER LOOKING UP. IT IS summer, and my father is kneeling on a platform pounding nails, each hammer blow echoing in the silent woods. Overhead, branches, twigs, needles and leaves weave a tangled tapestry. When it is finished, our tree house is perfect, snug in the giant V of two leaning hemlocks, feathery boughs sweeping close on all sides.

On clear days, we sprawl on our backs or lean against the rough trunk that comes up through the floor, telling stories, trying to imagine the future, watching the play of shadows and light. On cloudy days, we huddle inside with flashlights, listening to the percussion of rain on the canvas roof. When the neighborhood Bad Guys are after us, the tree house is our only hope. We scramble up the ladder, butt the trapdoor open and haul ourselves to safety in the nick of time.

Many of us fall in love with tree houses as children but leave them behind when we grow up. These days, though, more and more adults are rediscovering the joys of arboreal hideaways. Tree houses, it seems, are in—and branching out. They're the subjects of best-selling books and popular exhibitions. Some people enjoy their lofty living rooms as weekend retreats; others use them as offices, or even as full-time residences. When you construct a house in a tree, suspended between earth and sky, there are no rules. Treehouse architects design their own dreams—and then climb up to savor the view.

Businessman Albert Green uses his tree house as a blind for watching elk and moose on his 30-acre Montana ranch. The two-room, cedar-shingled cottage hugs the trunk of a giant ponderosa pine 30 feet off the ground. "You sit with these massive red limbs surrounding you, and the animals pass by right underneath," Green says. "Sunset is the best time of all. The color of the boughs deepens, the bark glows. Everything's ablaze."

Ed McBee and Randy Geiger planned their tiny pentagonal tree cabin in Duvall, Washington, as a private retreat. It's equipped with everything two 40-ish guys could want. There's a stereo and, of course, a TV, so they can cheer on the Mariners during baseball season. There are two fold-out bunks, each with its own reading light. A Dutch door makes it easy to haul up groceries, beer and children. On the roof, McBee and Geiger have added their newest fantasy—a golf tee.

Linda Beech built her screened-in sanctuary in an ancient monkeypod tree in Hawaii's Waipi'o Valley 25 years ago. Since then, it has sometimes served as a guest house, and dozens of visitors have recorded their impressions in the registry. For some, spending the night in a tree house sparked dramatic personal transformations. Those individuals left resolving to change their careers, get married, follow long-forgotten dreams. Beech herself visits often, sitting to contemplate the plunging 1,000-foot waterfall that roars just yards away.

Arborist Jonathan Fairoaks placed his tree house 90 feet up a tulip poplar on the ridge behind his Glenmore, Pennsylvania, home because he wanted a quiet place to read his favorite poet, Walt Whitman. Fairoaks makes the ascent with ropes and climbing gear, but his dog, Theiadocious, rides to the

A New York cabinetmaker put this cottage 40 feet up a live oak on the banks of the Suwannee River in Florida.

# Take a Bough

Built out of driftwood some 20 years ago, this tree house in Eureka, California (right), remains a favorite hangout for neighborhood kids. Deep in the woods of Massachusetts (below), Brother Michael visits a tree house used as a retreat at a secluded hermitage. Even pets enjoy tree houses. Arborist Jonathan Fairoaks (opposite) gets his dog, Theiadocious, ready for a lift.

top in a winch-driven "elevator" rigged from rope and a barrel.

Tree-house enthusiasts are perched in all kinds of trees for all sorts of reasons. But there was never a "tree-house central" until Peter Nelson came along. Thanks to his book, *Tree Houses: The Art and Craft of Living Out on a Limb* (Houghton Mifflin), the arboreally inclined are starting to discover each other. Since it was published three years ago, the book has sold more than 50,000 copies. "Pete is 'Mr. Tree House,'" says Wendy Wolf, senior editor at Viking Penguin, which will publish Nelson's second tree-house book this year. "He's one of the few builders who take tree houses seriously as shelter for adults."

The 35-year-old contractor, who resides in Fall City, Washington, with his wife and three young children, has built more than a dozen tree houses in the past few years, ranging from a pint-size cottage in an apple tree to a graceful round house with French doors that floats 35 feet up in a Douglas fir. "They're magical little structures," says Nelson, who lives in a conventional house but climbs a tree to go to work. "No good person doesn't like them." From the outside, his neatly shingled office looks like the prow of a ship cutting a wake through green waves of fir. Nelson, whose great-great-grandfather was, in fact, a ship captain, tells of riding out violent storms in his tree house. He points to the tight grain in the massive recycled fir timbers that support the structure.

TOP, CHAD SLATTERY; OPPOSITE, PAUL ROCHELEAU. LEFT, MICHAEL SMITH

"They're the kind shipbuilders would kill for," he says.

One reason Nelson has become such a fan is that tree houses are the antithesis of sameness. Each one is a statement of bold opposition to subdivision blandness and high-rise monotony. Tree houses surprise us.

Nelson flips the pages of his book, pointing out some favorites. Two tiny houses of driftwood, designed by a California crabber as a memorial to his drowned son, rise like Dr. Seuss fantasies above neighborhood rooftops (p. 103). One man built his tree house in a giant live oak next to a Florida river (pp. 95, 102) but had to move it to a nearby cotton field when a new landowner evicted him from the tree.

Another Nelson favorite, located not far from where he lives, is fashioned entirely of mullioned doors and windows. The closet-size dwelling was built at the Pilchuck Glass School in the early 1970s, when the place was new and artists and students had to supply their own housing.

Nelson has definite opinions about the esthetics of tree dwellings. "Proportion is everything," he says, turning to a picture of a three-story "high-rise" built by a Minnesota man in his backyard. "You don't want the house to overwhelm the tree like this one does."

Nelson's business has grown along with his passion for tree houses. Projects have ranged from a few thousand dollars up to $30,000. He has built tree houses for single guys like Albert Green and for families like Paul and Susie Wyckoff and their four daughters, who insist that "tree houses are not just for boys." Nelson's even been to Japan, where he helped a group of outdoor enthusiasts build a tree house to be used as an overnight campsite.

Two years ago, Nelson built a tree house for Gus Guenther, a fisherman and sled-dog racer in Clam Gulch, Alaska. "It's a work of art," says Guenther, who lives in it year-round. "Definitely the best-looking shack in Clam Gulch." With some creative wheeling and dealing and plenty of help from his friends, Guenther's 12-by-16-foot palace in the trees cost only about $2,000 and took eight days to build. It has big bay windows and tongue-and-groove pine paneling. Outside it's covered with cedar siding and features a little veranda with a birch railing on one end. You can almost picture it in the real-estate pages: "Cozy starter home"—except that it's anchored to four spruce trees and sways noticeably when stiff westerly winds sweep across Cook Inlet.

Last fall, Nelson, who thinks anyone can learn to build a house in a tree, conducted a workshop at the Omega Institute in Rhinebeck, New York. When I arrived, his friend and fellow workshop leader, Jonathan Fairoaks, was dangling in the air, 40 feet up. Suspended with ropes from an oak tree, he reached for the chain saw swinging from his hip, wedged his foot against the trunk and started lopping off dead branches.

In another cluster of trees, Nelson stood on a loose plank shouting instructions. On the ground below, more than two dozen people were at work, including a data analyst, an architect, a truckdriver and an artist. All of us were toting lumber, lifting ladders,

*Tree houses are the antithesis of sameness. Each one is a statement of bold opposition to subdivision blandness and high-rise monotony. Tree houses surprise us.*

passing tools, hammering. Our objective was to build two small, Adirondack-style tree houses in five days, one high, one low.

As Nelson explains in his book, you build a tree house pretty much the same way you build a regular house. The first component is a sturdy platform consisting of beams, joists and flooring. What comes next can range from a simple railing (to prevent people from falling over the side), plus maybe a lean-to roof and a blanket for a front door, to a more elaborate structure complete with walls, windows, real doors and a conventional pitched roof. Every tree house is different; the particular configuration is determined primarily by the tree or trees you select for support.

Nelson uses two-by-twos or two-by-threes for the wall framing because they are lighter than two-by-fours. He likes to build the wall and roof sections on the ground and then hoist them onto the platform with a pulley or block and tackle. Access to the finished house can be provided by a wooden or rope ladder, a fixed staircase, or even a dumbwaiter type of contraption that enables you to haul yourself up in a sling or some other conveyance.

By the end of the workshop's second day, the platforms for both houses were nearly finished. Each beam was bolted to the tree only on one end; the other end was suspended from a steel cable so it would be free to sway. "Bolt it too securely and the house will twist and maybe snap," says Nelson, who estimates that the average adult tree house, about 250 square feet, weighs around 5,000 pounds. Proper building techniques are important for the trees, too. "Go about building a tree house poorly," cautions Fairoaks, "and you can kill the tree."

Some builders are reluctant to drive so much as a single nail into a tree for fear of injuring it, but Nelson says a few carefully placed fasteners will do no harm. The real danger is cutting through the bark into the cambium layer, which conveys the flow of nutrients. If the cambium is cut more than halfway around a branch or trunk, it can kill that branch or the whole tree. For this reason, Nelson always makes sure to wrap cables in garden hose or use wooden blocks as buffers where cables pass across the bark.

Of course, the best way to ensure the health of the tree is to pick the right one to begin with. Some trees are sturdier than others. Nelson prefers maple, oak, fir and hemlock. He believes load-bearing branches should be at least six inches in diameter—even thicker on weaker species.

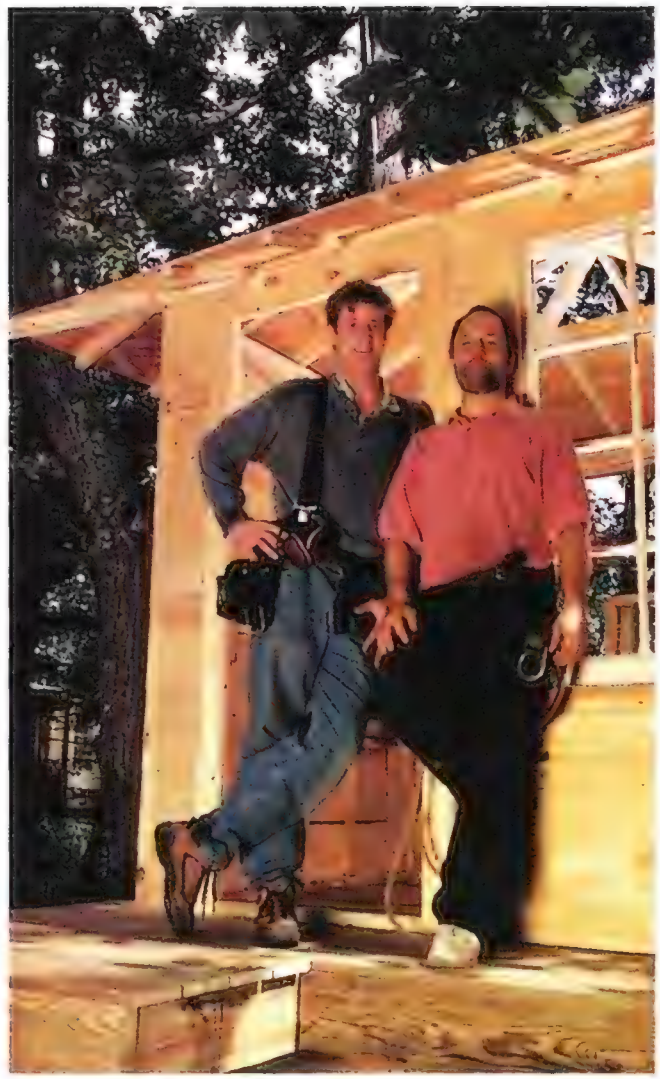
Fairoaks says it's a good idea to have the tree in which you intend to build a house examined by a certified arborist, and then follow his recommendations. If the arborist says the tree you've selected is unsuitable, perhaps he can help you find a better one. After making an initial assessment, Fairoaks gets rid of weak, damaged or diseased branches. He also sometimes removes live branches in order to thin the crown and lower the center of gravity. In this way, he reduces wind resistance and compensates for the added weight of the structure.

Day Three: I buckled into a safety harness and climbed to check the progress on the higher tree house. Ropes and safety lines were everywhere. Ned Leavitt, a literary agent from New York City, was inching toward the end of a support beam to retrieve a tool and trying not to look down. Lia Prentiss, a child-care worker from Colorado, was singing "Rock-a-bye-baby on the tree top." Someone handed me a bunch of nails. Four hammers were going at once as floorboards were pounded into place.

On the ground, Nelson was explaining the difference between headers and cripples, jack studs and king studs. He grabbed two-by-twos as he spoke, checked for warp, cast some aside, saved others. Pulling a pencil from behind his ear, he marked dimensions. Before long, everyone was huddled in clusters, measuring and hammering, and wall frames were taking shape.

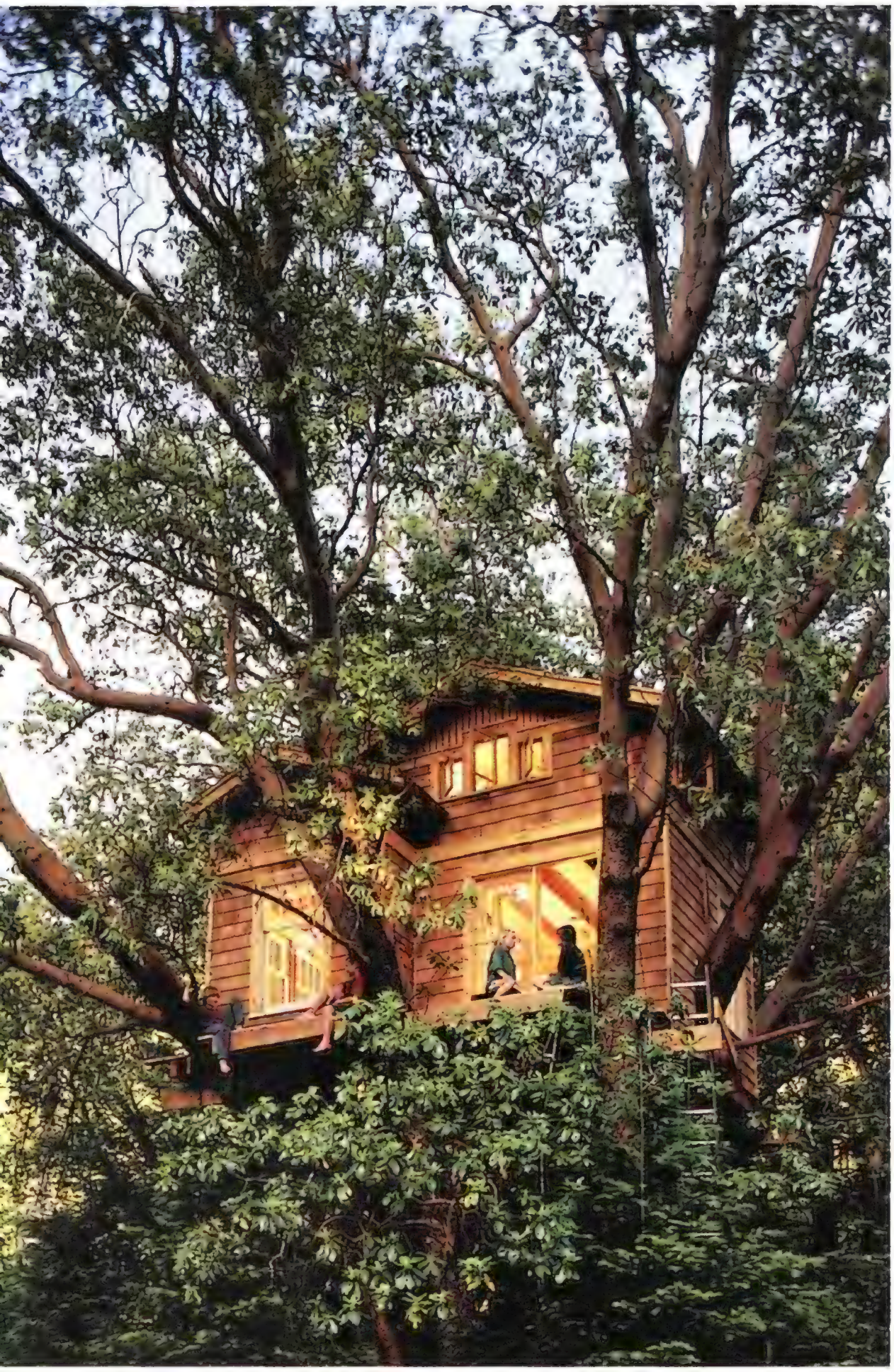
Finally we were ready to hoist the first wall. Fairoaks and his "sky crew" looked down from the high platform. Nelson tightened knots on the ropes securing the waiting wall. "Ready? Go!" Suddenly the ground crew was hauling away. The wall dipped and spun, an unwieldy burden. "Let it down a foot or two," Fairoaks yelled. A few more adjustments and the wall was up, many hands reaching to steady it.

Late on the last day of the workshop, Nelson sank the final screws into the roof of the lower tree house. The sky was darkening. Hammers stopped one by one as the light began to fade. Someone fetched a lantern to hang inside, and suddenly the lumber we'd been measuring, cutting and nailing was transformed into a tree house, a



Builder Peter Nelson, left, and arborist Fairoaks take a break from their tree-house-building workshop. Opposite: This lofty retreat in California sleeps 15.

STEVE WINTER; OPPOSITE, CHAD SLATTERY



*Tree houses have been inspired by more than necessity. People have long been inclined to build them simply because they are so much fun.*

glowing space suspended in the night.

The notion of building shelters in treetops is not new. Old engravings depict treetop dwellers in the South Pacific living in thatched nests and riding up and down in baskets. In New Guinea, tree houses offered protection from enemy attack. Even today, some inhabitants of Irian Jaya, a province of Indonesia in the western part of New Guinea, live high above the forest floor in houses built of palm fronds.

But throughout history, tree houses have been inspired by more than necessity. People have long been inclined to build them simply because they are so much fun. Anthony Huxley's *An Illustrated History of Gardening* notes that the Romans seem to have gone in for tree seats, and that, from the Middle Ages on, tree arbors were popular. One famous specimen, built into a giant lime tree in England, rose for three stories—leafy rooms of bent branches one on top of the other, "the goodliest spectacle mine eyes ever beheld for one tree to carry," wrote John Parkinson in his *Paradisi in sole* of 1629. Parkinson also marveled at the second floor, "wherein might bee placed halfe a hundred men at the least. . . ." Apparently this tree house attracted royal attention. It is thought that Queen Elizabeth I herself once stopped for dinner in the second-floor banquet hall, joined perhaps by "halfe a hundred men."

During the Italian Renaissance, the Medicis seem to have been driven by a sort of architectural family rivalry to see who could pack the most marble into a tree. One of their extravaganzas included a marble table, seats and fountains, and two marble stairways that spiraled up on opposite sides of the tree. This marvel was depicted in a 17th-century engraving by Stephano della Bella. And in his travel writings of 1580, Montaigne recorded his visit to a Medici tree house.

In England, a half-timber cottage originally built in the late 17th century on the grounds of Pitchford Hall in Shropshire is still perched in the garden lime tree. A 13-year-old princess who grew up to be Queen Victoria visited this one-room tree house on October 28, 1832, noting the occasion in her journal: "At a little past one we came home and walked about the grounds, and I went up a staircase to a little house in a tree."

In France, a chestnut-lined street in a

town just west of Paris became known in the mid-19th century for its arboreal restaurants. While musicians and dancers made merry on the ground, diners climbed into small gazebo-style dining rooms among the branches and were served elaborate meals hauled up by means of ropes and pulleys. Advertising their *"Magnifique point de vue,"* those restaurants flourished for more than a century.

Two historic French tree houses still stand. Tiny twin chapels in the trunk of a venerable oak in Normandy have survived lightning, as well as the wrath of revolutionaries. In daily use for more than 300 years, the landmark rises from the churchyard in Allouville-Bellefosse. Though it's lost many branches, the tree lives on, topped by a spire with a cross.

Early in this century the American novelist Mary Austin secured her reputation as an eccentric when she constructed a rustic tree house among gnarled pines in Carmel, California. Austin was visited in her "wick-i-up," as she called it, by friends and fellow writers Robinson Jeffers and Jack London. A yellowed photograph in the Carmel library archives depicts Austin in her open-air writing room, pen in hand, pine tree at her back. She spent mornings there, according to local lore, reviewing proofs of her work.

Some of history's most memorable tree houses exist only in the imagination. Dutch artist Hieronymus Bosch's "Tree-man," from his triptych *The Garden of Earthly Delights*, inhabits a surreal tree-house-from-hell peopled with strange half-human creatures. In A. A. Milne's Hundred Acre Wood, Owl's tree house, which boasts both a knocker and a bellpull, is the site of frequent visits from Winnie-the-Pooh and other forest friends. Nowadays many newspaper readers across the country keep tabs on the treetop world of Shoe, a comic-strip character created by Pulitzer Prize-winning cartoonist Jeff MacNelly.

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The most famous tree house of all time, designed by writer Johann David Wyss, was home to the Swiss Family Robinson. Literature's shipwrecked clan lives happily at Falconhurst, high in a mangrove tree. The Disneyland version of this treetop address is situated in a 150-ton *Disneydendron semperflorens grandis* in Anaheim, California. The "everblooming Disney tree" is constructed of 110 cubic yards of concrete and six tons of reinforced steel. In keeping with the novel, a waterwheel at the base of the tree sends water to the rooms overhead, carrying more than 200 gallons per hour in bamboo buckets.

One recent innovation in arboreal architecture might surprise even the resourceful Robinsons. It's a portable tree house that's held in place with an ingenious system of metal anchor blocks, chains, cables and L-frames. Manufactured by Treecamp Developments Ltd. of Victoria, British Columbia, the two-story, tipi-shaped abode mounts onto a single trunk and can be assembled in six hours. "At first, I thought the guy who designed it must have been a mad scientist," says Vancouver Island forester Ron Adair, who spent about $5,000 for his prototype portable a year ago. "But the thing is so nice, I'd have a mutiny on my hands if I ever suggested going back to our old tents."

Adair and his crew work in forests so remote they have to be flown in by helicopter. They used to camp on the ground, but these days, they live in the portable. "Putting it up is fun," says Adair. "We always try to position it so

ALEX RAMSEY/COUNTRY LIFE PICTURE LIBRARY

You'll look at it and
see flashes of its fire.
Touch it, learn to know
its facets, every one, by heart.
To take it off would be like leaving
a small part of yourself behind.
Your diamond, extraordinary and rare.
Why wait?
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we have the best view of the mountains or river."

After a long day in the woods, the men return to Bush Condo, as they call it, where Dan the cook is making dinner 14 feet off the ground. The first-floor kitchen is simple—a sink and a couple of three-burner propane stoves—but the dinners are spectacular. Adair's favorite reads like a fine restaurant menu: baked Brie with pesto, chicken Kiev, steamed carrots and Caesar salad, plus a big slab of cheesecake for dessert. After dinner, Adair climbs a ladder to the second-floor sleeping quarters and relaxes with a book. On clear nights, the guys sometimes zip the roof wide open and fall asleep with nothing overhead but evergreen branches laced against the dark sky.

Nights in the tree house can be fitful. "We're sitting on a powder keg of food," says Adair. "That's nerve-racking when you have grizzlies with behinds the size of Volkswagens in camp all the time. We can't afford to lose our food supply." The men are usually able to scare the bears away by yelling and banging on pots and pans. On particularly bad nights, the cook improvises "bear grenades"—bacon-wrapped cans of mace. Tossed to the ground, they become effective deterrents as soon as a bear takes a bite. Grizzly duty's still nerve-racking, but thanks to the tree house it's safer than it used to be.

For geologists Judy and Campbell Bridges, who have conventional homes in Nairobi and Virginia, it was the marching, munching ants that helped inspire their tree house. "It took them more than an hour to pass our tent," says Judy, recalling a night in the wilds of Kenya surrounded by marauding *siafu*. The stinging ants are known to eat everything in their path. "You could hear them the whole time," she says. "Suddenly a tree house seemed like a really good idea."

The lion experience clinched it. "He was roaring a foot from our tent, trying to flush us out," remembers Judy. "We were hidden, thank goodness, so he didn't realize he could get at us with a swipe of his paw." These days the Bridges are still jolted awake by lions roaring nearby, but they're no longer afraid because they know they are safe in their tree house.

*Once Michael Garnier piled 66 people, three dogs and one cat—10,488 pounds—into one of his tree houses to demonstrate how well it was built.*

In the years since they staked their mining claim near Kenya's Tsavo National Park, the Bridges have entertained some of the world's most famous gem dealers. Their guests, who come for the tsavorite, a rare green garnet, conduct their business 15 feet up in a "gambol flam" tree. The tree house is open at both ends, so breezes can blow through. Decor is sparse—mining gear, kerosene lanterns and foam mattresses. "But these big industry people, some of the most influential in the world, love to stay with us," says Judy. "It reminds them of their boyhood."

For those who are not faced with threats of grizzly bears or marching ants, tree houses offer escape from less deadly pressures. Doug Thron's getaway in Northern California (p. 99) serves as a base camp for office-weary adults and city kids who have never seen an eagle fly. Big enough to sleep 15, the solar-powered house sits 20 feet up in the "palm" of an ancient madrona tree, which grows out of the ground like an open hand. After a day of river rafting or mountain climbing, Thron and his campers fall asleep in their tree-house bunks listening to night sounds never heard on city streets or in suburban neighborhoods.

People without a tree house of their own can plan the perfect escape to one at the Out 'n' About Treesort near Takilma, Oregon. Owner Michael Garnier has enjoyed a steady business there since he built the first of his four elaborate tree houses in 1990. "He's unbelievably dedicated," says Peter Nelson, who admires Garnier's craftsmanship. Nelson, along with Jonathan Fairoaks and a host of other tree-house enthusiasts, will gather at the Treesort in October for the first meeting of the World Treehouse Association (WTA).

Attendees will share advice on tree-house design and tree care. Garnier,

Opposite: The first floor of the Florida house shown on page 95 has everything, including a wood-burning stove. The ladder leads to a sleeping loft. Right: At dusk, windows in a pair of California driftwood houses reveal the cozy glow of light on wood.

the WTA's president, will offer a building-permit workshop based on his own experience doing battle with local inspectors, whom he refers to as the Tree Stooges. Mostly, though, the WTA members will sit around swapping stories of arboreal adventure. Garnier will probably tell about the time he piled 66 people, three dogs and one cat—10,488 pounds—into one of his tree houses to demonstrate how well it was built. Nelson might tell about his first tree house, a shingled cottage that came crashing out of the tree (no one was inside) because of a couple of poorly conceived architectural details: the heavy brick fireplace and chimney.

Some tree-house tales are becoming legendary. Like the saga of Bob Redman, who managed in the 1980s to build 12 different tree houses in New York City's Central Park before authorities finally tracked him down. And then there's the famous elevator tree house, designed by a 70-year-old New Jersey man who was wary of climbing the 80-foot oak in his backyard. He built his tree house to rest on the ground. On nights when he hankered to enjoy a view, he just stepped inside and pumped the foot pedals. Liftoff! In a few seconds he was high enough to take in a panoramic vista of city lights winking below.

These stories illustrate the extreme lengths to which some tree-house aficionados will go to create their getaways. Sometimes their schemes are meticulously designed. Other times they just happen. Rick Brown's story about his tree house outside Greensboro, North Carolina, starts like a confession. "It was originally supposed to be a small, one-story tree house for my son Kenny," he says, "but I couldn't stop." It took six years, three stories, a crow's nest and a 24-foot flagpole—plus $10,000 to repair a knee ligament Brown tore while working on the project—but he finally broke through the top of his 75-foot chestnut oak.

Tree-house people usually are rewarded for their persistence. Take me, for example. Recently I spent a long night huddled alone inside a swaying suite at the Treesort, listening to the wind and rain, and the bursts of acorns peppering the roof. The next morning, before leaving, I became an official member of the Tree Musketeers, a special honor bestowed on all Treesort guests. "I pledge to do everything in my power to protect tree houses and trees," I repeated after Michael Garnier. His voice was solemn as he administered the oath, but his eyes twinkled. "All for trees and trees for all!"

*Suki Casanave, a freelance writer based in New Hampshire, rose to new heights while doing the research for this story.*

GEORGE C. MARSHALL

# THE LAST GREAT AMERICAN?

BY LANCE MORROW

NO SOLDIER SINCE WASHINGTON HAS HAD HIS ROMAN VIRTUES, AND SO SIGNIFICANTLY SHAPED A PEACE

IN MY MIND, A DIAGRAM OF AMERICAN military history might begin with a parallelogram of Georges—George Washington and George Marshall; George Armstrong Custer and George Patton. A geometry of paired opposites. In some ways, George Marshall is the best of them all.

Custer and Patton are the Hotspur sides—martial peacocks, brave, vainglorious and, in Custer's case, fatally heedless. The cavalier Georges favored flamboyant touches: Custer with his personal flag and a regimental band, mounted on white horses, playing "Garryowen" across the Montana plains; Patton with ivory-handled pistols and his warrior-mystic's déjà vu—he thought that he had fought with Alexander the Great in another life.

Well, as George Marshall said, ruefully, a democracy's leader, even in war, must keep the people entertained.

**Followed by his dog, Fleet, the Army Chief of Staff briefly escapes his military cares by riding at Fort Myer in 1941.**

Custer and Patton were performance artists who filled the stage with strut and plumage and flame. They conceived that the battle was essentially a dramatically amplified projection of themselves. Pairing Patton with Custer is unfair, perhaps. Custer's curtain call was an act of self-immolating folly; Patton, by contrast, was a brilliant tactician and a superb combat leader who redeemed his excesses when he brought the Third Army slashing across Europe toward Hitler's throat.

The other two sides of the parallelogram, the Stoic Georges, shaped larger American business. Washington and Marshall were soldiers of maturity and gravitas: father figures, not sons. In both generals duty evolved beyond ego and broke through to a sort of higher self-effacement, an identification by which they merged themselves with their country's purposes. The Greeks might have thought Patton and Custer embodied hubris; they would have assigned Washington and Marshall to the realm of *arete*, or virtue—the self fulfilled in noble accomplishment for the state. Washington and Marshall were not only warriors but, after their wars, something more constructive than that.

As Emerson said, "Every hero becomes a bore at last." Washington and Marshall both may seem too good to be true. But when I put Washington and Marshall side by side, and look at them against the background of the national leadership now in office, it is easy to think that I am looking at the first American grown-up—and the last.

As much as any man, Marshall saved world democracy at the moment of its greatest danger. He took up his duties as U.S. Army Chief of Staff on September 1, 1939, the day that Hitler marched into Poland. He began with an absurdly ill-equipped army of 174,000 men, ranking 17th in the world behind such nations as Bulgaria and Portugal, and turned it into a global fighting force of more than eight million, an army without which the Allies could not have defeated Nazi Germany and Japan. Ulysses Grant was the first master of industrial warfare. Marshall was the first genius of bureaucratic warfare, a Napoleon riding a desk. Not martial flamboyance but logistics saved the world in 1939-45, although the world still may not be mature enough to understand that.

April 1945: triumphant Red Army soldiers wave a flag over the ruins of Berlin; in a 1947 cartoon (right), Europe hauls itself up from a "rubble heap" with help from the Marshall Plan. West Berlin was rebuilt, but the U.S.S.R. and its satellites refused Western aid.

Could anyone else have done the job as well as Marshall? No. Was Marshall indispensable? The question has no answer, except perhaps a quotation from the *Tao Te Ching*: "The Master doesn't talk, he acts, when his work is done, the people say, 'Amazing: We did it all by ourselves!'"

The recent anniversary of the Marshall Plan notwithstanding, as a soldier George Marshall is half-forgotten now, or four-fifths forgotten, as he knew he would be. That was part of his virtue. There was a moment around Thanksgiving of 1943 that might have changed everything and propelled Marshall into higher historical orbit. Franklin Roosevelt needed to settle upon the general who would lead the Allied invasion of France and the reconquest of Europe. Everyone assumed that Army Chief of Staff George Marshall would get the job he had magnificently earned.

On his way to meetings in Cairo and Tehran, Roosevelt discussed the question with Dwight Eisenhower, then the commander of Allied forces in North Africa and the Mediterranean. As they flew over Tunisia, the President thought out loud: "Ike, you and I know who was Chief of Staff during the last years of the Civil War but practically no one else knows, although the names of the field generals—Grant, of course, and Lee and Jackson, Sherman, Sheridan and the others—every schoolboy knows them. I hate to think that fifty years from now practically nobody will know who George Marshall was. That is one of the reasons why I want George to have the big command. He is entitled to establish his place in history as a great general."

Eisenhower listened in silence. He, of course, wanted to command the invasion but, like everyone else, assumed the job would go to Marshall. In Cairo in early December, FDR tried to get Marshall to state a preference. Marshall said only that he would do what the President wanted him to do.

Days later, FDR made his decision. He reasoned that no one else could deal with Congress as effectively as Marshall did—no other soldier would have Marshall's immense moral authority and credibility. No one else knew the world military situation so well. As the Cairo Conference ended, Roosevelt told Marshall: "I feel I could not sleep at night with you out of the country."

It was done. Marshall accepted the decision without question or comment. Both Roosevelt and Marshall were correct in predicting that being kept at his desk in the War Department would deprive Marshall of the honor in history that he deserved.

History is not fair. Marshall was a greater man than Dwight Eisenhower, yet it was Ike who went to the White House for eight years. Marshall was a greater general, and a better man, than theatrical and self-promoting Douglas MacArthur. Yet MacArthur lives on more vividly in whatever remains of American historical memory. Despite the offer of seven-figure publishers' advances, Marshall refused to write his memoirs after the war; to do so, he suggested, would require him to tell the full story, and such truth-telling would sometimes wound old colleagues.

His concern for others was usually concealed behind an on-duty, crisply serious command manner that rarely permitted warmth or familiarity to show. The jovial Franklin Roosevelt on several occasions called him "George," but Marshall rejected it as not suitable

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from his Commander in Chief. He had a sense of humor, but one so rarely indulged, and so sly and dry that others could miss the point. At a World War I armistice celebration, a French attaché and a British observer debated the postwar distribution of Germany's colonies. When the Frenchman generously proposed giving Syria to the United States, Marshall declined: "America is opposed to any colony that has a wet or a dry season, and an abnormal number of insects." He allowed, however, that Bermuda would be acceptable. The Englishman was not amused.

Colin Powell and Norman Schwarzkopf, heroes of a 42-day video war, made millions for their memoirs. Marshall belonged to a pretelevision, almost Plutarchian, order. In some ways the burden that he bore was greater than that of Churchill or Roosevelt, because Marshall was the man who turned policy, mere ideas, into men and steel, into facts. He was held more mercilessly than the others to the standard of reality. After World War II, Churchill, who had worked closely with Marshall and often quarreled with him over Allied strategy, said of the Chief of Staff, "Succeeding generations must not be allowed to forget his achievements and his example."

Franklin Roosevelt's Presidential career fell into two acts—the Great Depression and World War II. Marshall played his two acts in the opposite order, from war to peace—first as the organizer of global battle, then as a preeminent statesman of the postwar period. During the 1930s, when America was basically isolationist and largely pacifist, Marshall, along with some others, had the historical imagination to anticipate war on a scale that would

In 1884, kid brother George already looked serious. Looking more serious still in 1900, he was a leading cadet at VMI.

*"It was about time for somebody else to swim for the family."*

have seemed to most Americans an apocalyptic fantasy. It took great daring and steadiness to prepare for such an apocalypse. Again, after the war, he led America out of isolation with the Marshall Plan.

Marshall's two great acts intersected one day in 1947, fifty years ago this June. Harvard University president James B. Conant presented to George Catlett Marshall a doctor of laws degree, *honoris causa*. The honor, Conant told the audience of 8,000 in Harvard Yard, went to "an American to whom Freedom owes an enduring debt of gratitude, a soldier and statesman whose ability and character brook only one comparison in the history of this nation." Conant understood the symmetry: the comparison was of course to George Washington.

By June 1947, the relief attending victory two years earlier had been lost in new anxieties. Churchill, deposed as prime minister and leading the loyal opposition, rumbled: "What is Europe now? It is a rubble heap, a charnel house, a breeding ground of pestilence and hate." The wartime alliance with the Soviet Union had all but disintegrated; the threat of Communist regimes in Europe and the Mediterranean was real. And now, in 1947, Marshall had a new assignment, Secretary of State. Marshall mistrusted eloquence; he said that he was bad with words, and in any case thought an officer should express himself through his deeds. Looking out at Harvard Yard, he adjusted his reading glasses, and began: "I need not tell you that the world situation is very serious . . ."

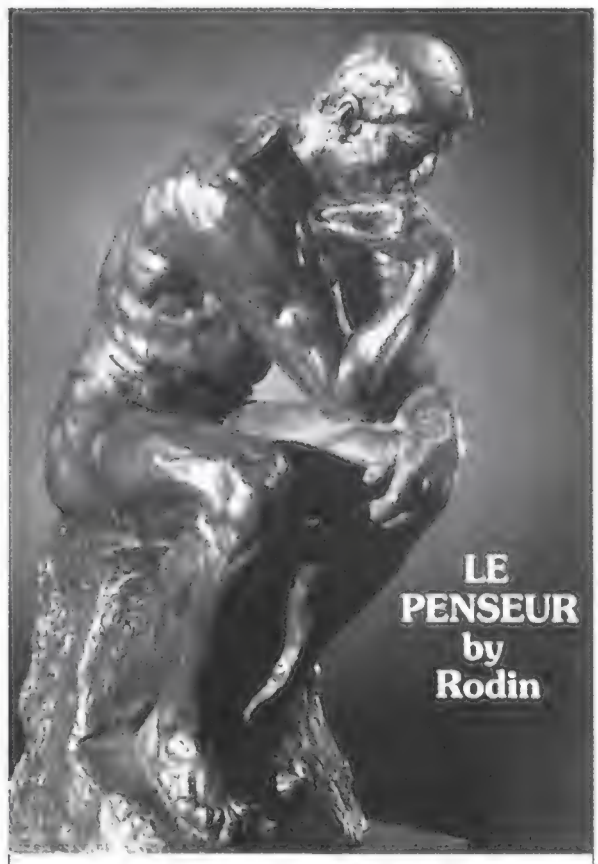
With that, Marshall set forth the outline of the European Recovery Program or, as everyone soon began calling it, the Marshall Plan. As the Cold War began, he set in motion the program that would save Western Europe from economic and political chaos, and from the totalitarianism that was overtaking mainland China and the Eastern Bloc countries. With Marshall pushing it in Congress and elsewhere, the plan was finally adopted despite notable opposition. "I worked on that," he later said, "as if I was running for the Senate or the Presidency."

He not only testified before Congress, he traveled the country patiently explaining. It was no giveaway program, he told businessmen; countries that wanted financial support had to come up with feasible plans for economic recovery. The aid had a fixed time limit and a fixed cost ceiling; it would be administered by an American businessman, not a bureaucrat, and there was plenty of accountability. Without a thriving Europe, who would we buy from and sell to? Without parliamentary democracy on the Continent, what chance was there for continued peace? Twice in 50 years, he reminded isolationists, America had gone to war to keep Europe free of "single-power domination," clear proof of how much Europe mattered to America.

Beyond that, in a vision of a future we understand better now than we did then, he noted that modern communications, vastly expanded during World War II, had made the difference between rich and poor nations more glaringly visible than in the past, a recipe for future trouble unless something could be done about the disparity. In the four years between 1948 and 1952 the Marshall Plan channeled some $13 billion in reconstruction aid and technical assistance to 16 European countries. For that Marshall received the Nobel Peace Prize in 1953.

### A SMALL-TOWN BOY

AS SOLDIER AND STATESMAN, MARSHALL served eight Presidents in a 50-year career. He was born on the last day of 1880, only 15 years after the Civil War, in Uniontown, Pennsylvania, in a primarily agricultural nation of 38 states. His career—young lieutenant in the Philippines at the turn of the century, General Pershing's chief of staff in World War I, organizer of victory in World War II, Secretary of State as the Cold War hardened—personified the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American transformation from small-town insularity to global preeminence. The arc of his life was also the nation's trajectory. He molded his life and work to his duty and nation—and those four things became indistinguishable.

Marshall's Pennsylvania origins had the savor of a manageable, self-sufficient and essentially innocent universe, congenial to boyhood, a sort of powerful Emersonian center from which Tom Sawyer might have gone forth into the greater world. The self-confidence instilled by such a childhood was one of those crucial (but usually obscure) sources of national energy as the United States moved out into the world for the American Century. It was the sort of boyhood that a representative American like Charles A. Lindbergh enjoyed and that Henry R. Luce, a missionary's son in China, dreamed of from afar, and forever missed. The soil of such childhoods nourished the myth of American bounty, generosity, blamelessness and immunity from evil in the world. Theodore Roosevelt fired these assumptions at the world as if they were cannonballs; Woodrow Wilson would turn them into a sort of missionary theology.

George Marshall was descended from John Marshall, the third Chief Justice, and from some of the oldest blood-proud families of Virginia—Catletts, Picketts, Taliaferros. His father, a prosperous Uniontown businessman, used to brag about the genealogy. The son reacted with embarrassment and irritation. "I thought that the continued harping on the name of John Marshall was kind of a poor business," he commented later. "It was about time for somebody else to swim for the family."

In a speech he gave years later in Uniontown, just before World War II, Marshall explained that he decided on a military career only after 1899, when, at 18, he watched the triumphant return from the Philippines of Company C of the Tenth Pennsylvania

A heart-shaped, floral float conveyed Dutch gratitude to Marshall in 1948.

Infantry Regiment: "No man of Company C could make a purchase in this community. The town was his. . . . It was a grand American small town demonstration of pride [that] reflected the introduction of America into the affairs of the world beyond the seas."

That bright moment—America's foreign adventure celebrated to the sound of John Philip Sousa—would arrive, several generations later, at the darker end of the trajectory when the soldiers arriving back, singly, from Vietnam received no welcome home except a glare, a complicated silence, or the taunt: "Baby killer!" (I have sometimes wondered what George Marshall would have done if, born 30 years later, his Commander in Chief had asked him to be the Westmoreland or the MacNamara of the American war in Vietnam. Marshall was, after all, a soldier impeccable in his loyalty and punctilious about obeying orders.)

Young Marshall wanted to go to West Point, but both Pennsylvania senators were Republicans and Marshall's father was a Democrat who supported William Jennings Bryan. Marshall decided upon the Virginia Military Institute (VMI) in Lexington, Virginia, which generations of Marshalls had attended.

His older brother, Stuart, VMI class

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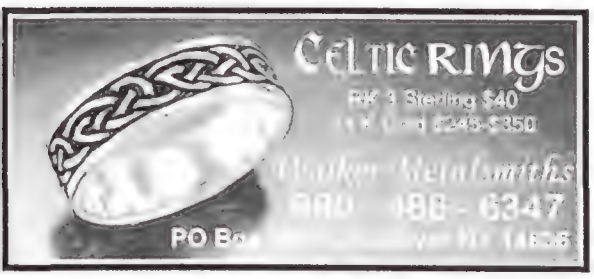


of '94, was against the choice. The brothers did not get along. Marshall recalled: "I overheard Stuart talking to my mother; he was trying to persuade her not to let me go, because he thought I would disgrace the family name. Well, that made more impression on me than all instructors, parental pressure, or anything else. I decided right then that I was going to wipe his face, or wipe his eye."

Marshall had his revenge. He not only distinguished himself at VMI, emerging in his final year as unanimous choice for first captain, the highest ranking cadet officer, he also courted and, after graduation in the class of 1901, married a Lexington woman, Lily Coles, six years his senior, whom Stuart had courted when he was a cadet.

### OFF TO MINDORO

THE SPANISH-AMERICAN WAR WAS over; Spain had relinquished Cuba, ceded Puerto Rico and Guam to the United States, and sold the Philippines to us for $20 million. But now the bloody Philippine Insurrection prompted the United States to expand its permanent army to 100,000. Marshall, a tall, lean, plain-handsome 20-year-old with sharp blue eyes and an air of crisp reserve, won a commission as a second lieutenant in the U.S. Army. Early in 1902, he said goodbye to his bride and set off for Mindoro Island in the Philippines, to begin a military career. It ended 49 years and seven months later at the retirement of Secretary of Defense George Marshall with the permanent rank of five-star general.

One of Marshall's attractive qualities as a leader was his refusal to condescend or bully; perhaps his relations with his older brother taught him that. A briskly intelligent reserve was an ingredient in his authority: no nonsense, but no overbearing power displays, either. He had a huge temper, which he eventually learned to control. He understood perfectly the way that, within the context of Army hierarchies, discipline could function

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During the fighting in Italy in 1945, Marshall finds time to visit the U.S. Fifth Army. Later an impassive Marshall takes a "backseat" beside an ebullient Eisenhower at a victory celebration. In 1943, the two discuss plans with Winston Churchill.

through a democratic subtext of respect given and required. Once when he came upon one of his officers berating an enlisted man (who no doubt deserved it), Marshall called the officer aside and said, "You must remember that the man is an American citizen just the same as you are."

In the Philippines he soon established an ironclad but low-key style of command. When he was leading his seven-man patrol single file across a jungle stream one day, one of the men yelled "Crocodiles!" The patrol stampeded for the bank, trampling Marshall as they went. "It wasn't a time for cussing around," he recalled, years later. Instead, he picked himself up, waded forward, ordered the men to fall in, then, at the head of the column, marched them back across the stream and then back again into the water and so across in proper military fashion. Then he held a rifle inspection.

In November 1903, Marshall was ordered back to the United States. Now began his long seasoning years—hard work in the obscurity of a peacetime army given over mostly to the waiting games of police duty, mapmaking and necessarily theoretical military exercises. An army at peace is an animal in hibernation; the seniority system congeals promotions. Garrison duty ritualizes spit and polish, and tedium.

Marshall was posted for a time at Fort Reno, in Oklahoma, on the north fork of the Canadian River. The Army's old rationale for Plains duty had by now expired; whites had all but completed their settlement, and the suppression of the Indians. From Fort Reno, Marshall set forth by wagon and mule train to map 2,000 square miles of the southwestern-Texas desert, some of the harshest landscape in America.

Because of the seniority system, Marshall would not be made a first lieutenant until late winter of 1907 but, in 1906, was admitted to the Army's Infantry and Cavalry School at Fort Leavenworth, Kansas. Such schools were to become battlegrounds between the Army's older conservatives and its younger reformers, who saw that, because of new weapons, the internal-combustion engine and Marconi's wireless, the nature of war had fundamentally changed. Agility, mobility, communications and firepower were about to alter its metaphysics.

It was Marshall's eventual mastery of the new realities—the need for rapid thinking and improvising, for a sure snapshooter's instinct in the field, supported by formidably organized pipelines of logistics and manpower—that made him at last the controlling wizard of World War II. Marshall biographer Ed Cray assesses the historic cost

of the transition in military thinking and the resistance of the military Old Guard to new ideas earlier in the century: "The successive bloodbaths blindly ordered by superannuated British and French generals at the beginning of World War I would validate the reformers, but the cost would be a generation of Europe's young men."

Ranked first in his class at Leavenworth, Marshall was promoted to first lieutenant and went on to Leavenworth's Army Staff College. In the years that followed, up until 1917 when he shipped out for the war in France, he established a pattern of distinguished performance at frustratingly low rank. At the age of 34, in 1915, and still a first lieutenant, he told the commandant of VMI that the "absolute stagnation in promotion in the infantry has caused me to make tentative plans for resigning as soon as business conditions improve somewhat." He soon thought better of it.

Marshall distinguished himself notably as a staff officer who, in a series of large-scale military maneuvers—on the Texas-Mexico border, in Connecticut, in the Philippines—proved a brilliant improvisationalist capable of moving whole armies with remarkable deftness. After the Batangas maneuvers in the Philippines in January 1914, an Army legend has it, the commanding general called his staff together to cite Marshall as "the greatest military genius since Stonewall Jackson." At Fort Douglas, Utah, in 1916, the commander, Lieut. Col. Johnson Hagood, paid Marshall an astonishing compliment on his efficiency report: "This officer is well qualified to command a division, with the rank of major general, in time of war, and I would like very much to serve under his command."

Woodrow Wilson, reelected in 1916 on a promise of keeping America out of war (as Franklin Roosevelt promised to do in 1940, as Lyndon Johnson promised in 1964), ended by getting us into the war in April 1917 and sending two million Americans to France under Gen. John J. Pershing, who was fresh from chasing Pancho Villa in Mexico.

### TOO VALUABLE FOR COMBAT

BY 1917, NO INTELLIGENT SOLDIER HAD illusions about the trench warfare that had been destroying Europe for three years. In one day, July 1, 1916, at the Battle of the Somme, England squandered 60,000 men, 2,000 more than America lost in 12 years in Indochina.

As the First Division's operations officer, a job usually assigned to a lieutenant colonel, Marshall began training and organizing the inexperienced American troops at Gondrecourt in Lorraine. He saw combat briefly as an observer along Gen. Henri-Philippe Pétain's Verdun front. (Marshall got caught under fire, then entangled in barbed wire, and left part of his pants on the barbs as he scrambled back to the trenches.) Made acting chief of staff of the First Division, he had a memorable encounter with Pershing. The general had exploded at Marshall's commander, Gen. William L. Sibert. Marshall, in turn, lost his temper on behalf of Sibert and blistered Pershing with a furious monologue about the condition of the troops, and inadequate supplies and transport. Marshall's fellow officers figured Marshall had committed professional suicide right before their eyes. In fact, Pershing decided


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that he had at last found an officer who would tell him the truth.

Marshall hoped for a troop command. Douglas MacArthur, almost the same age, was already a full colonel and chief of staff of the 42nd Division. Marshall, however, was considered too valuable as a staff officer. He was transferred to Pershing's headquarters at Chaumont. General Ludendorff's offensive in the spring of 1918, Germany's last hope of victory, had run out of gas. Marshall was ordered to plan the American part in an Allied counterattack.

Marshall's later story in World War II—too valuable for combat, condemned against his wishes to function as a sort of military desk wizard—was prefigured in the St. Mihiel and Meuse-Argonne campaigns. Rising rapidly and now holding the temporary rank of colonel, he organized the transfer of some 600,000 American troops, and 900,000 tons of supplies and ammunition, from the St. Mihiel sector to the Meuse-Argonne battlefield, all moved by night, in secret, and without detection by the Germans. It was one of the largest and most complicated logistical undertakings of the war.

The Meuse-Argonne operation in the fall of 1918 was a kind of localized rehearsal for the global task that Marshall accomplished in World War II. It called into play his remarkable gift of dispassionate concentration upon the task at hand. His second wife, Katherine Tupper Marshall—a widow whom Marshall married in 1930, three years after his first wife's death—observed his behavior during the first bleak months of 1942, when the Allies were being thrown back on almost all fronts around the world. She said, "It was as though he lived outside of himself and George Marshall was someone he was constantly appraising, advising, and training to meet a situation."

Neither the Meuse-Argonne campaign nor the logistics of America's global war succeeded simply because Marshall had character. He possessed an extraordinary intellect, an astounding memory and what might be called a kinetic military imagination—a genius for seeing the dynamic interaction of facts in rapid motion through time.

Marshall's focused analytical intelligence would be on display when he testified as Army Chief of Staff before Congressional committees or gave occasional press conferences. During World War II, he would sometimes invite 40 or 50 correspondents into his office, listen to a long series of questions from them, and then, without notes, deliver a half-hour monologue in which he answered each question in turn (facing the correspondent directly as he answered that man's question) and at the same time wove all the answers into a coherent overall picture.

After World War I, America, of course, demobilized, turning away in horror and relief from foreign nightmares to an isolationism that relied upon the vast Atlantic and Pacific moats. Marshall returned to America as personal aide to Pershing. With his commander he sat in on long conversations with President Warren G. Harding. Marshall stood above partisan politics but learned how to deal with politicians and national leaders—an apprenticeship that paid off later. His years as aide to the Army Chief of Staff gave Marshall an education in the political realities of soldiering in a democracy.

### THE "BENNING REVOLUTION"

BUT MARSHALL, ALTHOUGH SUFFICIENTLY horrified by the carnage of the war, again faced a soldier's frustration with peacetime. The nation heedlessly downsized its army to virtually symbolic proportions, and he was stuck with the permanent rank of major. After five years with Pershing, and a promotion to lieutenant colonel, he became assistant commandant of the Infantry School at Fort Benning, Georgia. It was there that he began training young officers in the lessons of firepower and maneuverability that formed the basis for the new Army. Tactics could no longer be static. Mar-

Seated in his garden at age 71, after retiring from a distinguished 50-year career as soldier and statesman, George Marshall at last manages to look relaxed.

shall trained officers with a view to what Cray describes as "that first aggressive thrust by an enemy increasingly motorized, with aircraft rather than cavalry to scout ahead." In one lecture Marshall said, "Picture the opening campaign of a war. It is a cloud of uncertainties, haste, rapid movements, congestion on the roads, strange terrain, lack of ammunition and supplies at the right place at the right moment, failures of communications, terrific tests of endurance, and misunderstandings in direct proportion to the inexperience of the officers and the aggressive action of the enemy. Add to this . . . fast flying planes, fast moving tanks, armored cars . . ." He was describing exactly the blitzkrieg used by Germany against France in 1940.

It was in his five years at Benning, during what became known in the Army as the "Benning Revolution," that Marshall began accumulating the roster of names—kept in his own first-class memory or else in the fabled "black book" that officers thought he maintained—from which he later put together American military leadership in World War II. Lieut. Col. Joseph Stillwell and Maj. Omar Bradley were among Marshall's instructors at Benning. It was at Benning, too, that Marshall developed the reputation—later a sometimes rueful Army legend—for ruthlessness in judging officers and sacking even the most experienced men in favor of junior officers who, in his judgment, were up to leading a modern army.

The 1930s were difficult for Marshall. He was in his 50s now, still a colonel. The Army's atherosclerotic system had reasserted itself. He confessed to Pershing, "I'm fast getting too old to have any future of importance in the Army." Finally, in October of 1936, Marshall made brigadier. Less than two years later, he went to Washington to become the Army's Deputy Chief of Staff under Gen. Malin Craig.

By now, history was boiling along like one of the dark-cloud montages tumbling in time-lapse photography across a movie screen. From Tokyo to Berlin, from Moscow to Chungking, to


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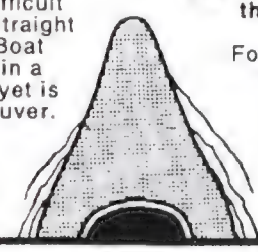

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London and Washington and New York, the world situation deteriorated. Stalin, Hitler, Mussolini, Roosevelt, Chiang, Mao and the Japanese all were making their preliminary moves. The Italian invasion of Ethiopia dramatized the weakness of the League of Nations and was a prelude to larger tragedy. In the Soviet Union, Stalin had launched the show trials that would result in the imprisonment or execution of millions of the U.S.S.R.'s party functionaries, bureaucrats, military officers, physicians and scholars—a social and cultural apocalypse.

And in March 1936, Hitler moved unopposed into the demilitarized Rhineland. Germany sealed alliances with Italy and with Japan, and helped establish Francisco Franco in power in Spain. In March 1939, Hitler occupied the remains of Czechoslovakia. In September, it was Poland's turn.

When Brigadier General Marshall reported for duty at the War Department in Washington, Chief of Staff Craig, an old friend from World War I, greeted him by saying, "Thank God, George, you have come to hold up my trembling hands."

Today, World War II and its aftermath seem a Jurassic age, a remote time when giants roamed the earth perpetrating primitive deeds (Fascism, global conquest, genocide and the nuclear awakening that was the war's last act). The cast of characters (Hitler, Stalin, Churchill, Roosevelt, Mussolini, Mao) has an earthshaking, mythic quality. Out of the origin myth, Hitler became the baseline for the discussion of evil, as Munich became the cautionary model of appeasement.

George Marshall becomes in my mind the paradigm of a certain kind of American virtue, now all but extinct. Marshall lingers in the nation's memory, I think, with a wistful poignance—a kind of reproach.

*Lance Morrow, author of* Heart: A Memoir, *is a* Time *magazine essayist and university professor at Boston University.*

***Olives: The Life and Lore of a Noble Fruit***

Mort Rosenblum

North Point Press, $25

*Olives* is a literate and lively story of a tree, the fruit and the oil it yields, and the robust and colorful characters who make their living from this most Mediterranean of crops. This is not a scholarly book—Rosenblum is a journalist whose interest in olives was inspired by a collection of neglected trees on the property of a house he bought in southern France—but every page conveys the author's admiration for the "remarkable little drupe" that invigorates so many people's lives.

The book hops from small groves on the sun-bleached hills of Palestine to vast orchards on the plains of Spain, from the tangle of overgrown trees behind the author's house in Provence to phantom plantings in Sicily, whose only yield is a harvest of subsidies from the European Union bureaucracy in Brussels. With no index, glossary or maps, the author's odyssey is sometimes difficult to follow. But his observations, anecdotes, recipes and drawings are so engaging that in the end the absence of traditional guideposts doesn't seem to matter.

Rosenblum describes planting and pruning, picking and pressing, taste and trade, and the intricacies of a market where the only thing protecting consumers is faith in the producer they buy from. He recites a dreary litany of things that can go wrong in growing and processing olives, and revels in the rich strong taste of the fresh-pressed oil when everything in the harvest has gone right. He conveys the flavor of life in those sunny lands where olives have "sustained family after family for thousands of years."

At the heart of this tale, like the sturdy trunk of an ancient tree, is Rosenblum's unabashed judgment that the old ways are better. Traditional presses, he thinks, make better oil than modern centrifuges. Handpicking is better for olives than harvesting them with mechanical shakers. The carefully pruned and tended trees of small-scale producers in Tuscany and Provence are better than the full-foliaged trees of Spain or the industrial-scale plantations he saw in Greece.

To Rosenblum olive oil represents far more than a mere agricultural commodity. Yes, he reports, it must contain less than 1 percent oleic acid before it can be labeled "extra virgin." Taste is enormously important, and he even admits to appreciating elegant packaging for its own sake. But ultimately, it is an oil's individuality that affects him most—its distinctive color, clarity, flavor and bite. "I loved the oil," he says of an award-winning French product refined with precise techniques and the finest modern equipment, "but I missed the passion."

*Readers will find themselves drawn in by a story that is rich with flavor and full of passion.*

Rosenblum's own passion is founded on the olive's historic connection to Mediterranean peoples and landscapes. Ancient presses and broken amphorae highlight the olive's role in prehistory. References from Sappho, Pliny and Cato show its importance in classical Greece and Rome. Modern recipes and statistics (in Greece, "they average twenty liters a year for every man, grandmother, and infant") emphasize the significance of this fruit in contemporary Mediterranean cultures and cuisines. And his description of how he accomplishes his own harvest—"find a few friends who have forgotten their *Tom Sawyer* and invite them down for the holidays"—offers a clever reminder of the communal spirit that has been central to the olive-growing tradition over the centuries.

Still, the essence that dominates these pages is the strong, sharp spice of obsession. As a result, while Rosenblum's tour of oliviana contains its share of Homeric elements, the literary figure this book brings to mind most strongly is Coleridge's albatross-fixated ancient mariner.

The book's cover, with a fat black olive standing in for the letter O, and a Van Gogh grove of olive trees fronting a luminescent green sky, will grab the attention of at least one in three passing along a bookstore aisle. Those browsers who stop, who open the book and then pause to read a passage or two, will find themselves drawn in by a story they would hardly have expected to hear. It is a story that is rich with flavor and full of passion, and just as with olives and their oil, these are the things that matter most.

*John R. Alden tasted nine olive oils on display at a local delicatessen before writing this review and, in the end, bought three.*

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***Eyewitness to America***

Edited by David Colbert

Pantheon, $30

David Colbert had a disarmingly simple idea: take all the major events of American history, add a few extras for entertainment, find someone who was there for each one, and publish their descriptions. Voilà, eh? Call it *Eyewitness to America*. Not altogether original, perhaps, but straightforward, worthy, most certainly dramatic and occasionally riveting.

None but the pickiest churl could find a significant omission in this compilation. It's all here, chronologically, from Columbus to Bill Gates: John Adams and Thomas Jefferson arguing politely, each deferring to the other, over who was to draft the Declaration of Independence; one of Lewis and Clark's men impetuously planting a foot on either side of the tiny stream that ultimately becomes the Missouri River; Lincoln at Gettysburg, the President moving through his speech so quickly that the photographer didn't have time to snap a picture; Rosa Parks, not so much physically tired as "tired of giving in," deciding, in that fateful moment, not to yield her seat to a white bus rider in Montgomery.

There are dozens of illuminating moments in these narratives told from the vantage point of participants and witnesses. Most of the accounts flesh out the stories we all know with human, sometimes surprising, details. Here is White Bull, the Sioux chief who actually killed Custer ("He drew his pistol. I wrenched it out of his hand and struck him with it . . . shot him in the head and fired at his heart"). And feminist pioneer Susan B. Anthony denouncing a judge who fined her for daring to vote ("I shall never pay a dollar of your unjust penalty [and I] rebel against your man-made, unjust, unconstitutional forms of law"). Gen. George C. Marshall (see p. 104), asked by President Harry Truman to review the President's correspondence with Gen. Douglas MacArthur before Truman fired MacArthur during the Korean War, reports back to Truman, "You should have fired the son of a bitch two years ago."

Call it journalistic bias, but I prefer the action narratives (the Oklahoma land rush, the sinking of the *Titanic*) to the more contemplative accounts (the birth of the United Nations). And journalists are better witnesses than politician-participants grinding their ever-present axes.

The best writing, not surprisingly, is on the sports page, here represented by Heywood Broun describing a moment in a World Series game ("[The catcher] peeked at the bench to get a signal from [Giants manager John] McGraw. . . . it is etiquette to take the signals from the bench manager furtively. The catcher is supposed to pretend he is merely glancing around to see if the girl in the red hat is anywhere in the grandstand"). Or Hunter S. Thompson on the Super Bowl buildup ("For eight long and degrading days I had skulked around Houston [drinking] all the free booze I could pour into my body and [listening] to an endless barrage of some of the lamest and silliest swill ever uttered by man or beast").

Fishing among all these glittering little vignettes for a closing example, I am drawn irresistibly to an interview with Al Capone by a British journalist in 1929, in which the archetype mafioso defends himself as a poster boy for American get-up-and-go: "'My rackets,' he [said], 'are run on strictly American lines and they're going to stay that way. . . . This American system of ours . . . gives each and every one of us a great opportunity if we only seize it and make the most of it.' . . . he stared at me sternly for a few seconds before reseating himself." I think it's the word "sternly" I like best.

*Donald Dale Jackson, a frequent* SMITHSONIAN *contributor, is a writer who is based in Connecticut; he specializes in history.*

***The Pinball Effect***

James Burke

Little, Brown, $23.95

A medical researcher once told me that the progress of science and discovery may appear to advance in logical steps, but it's actually more whimsical, driven by what she called the "Look at that!" phenomenon: "Scientists may work on a problem for years," she said, "and then something we never noticed before suddenly catches our eye and we say, 'Look at that!' and we begin to investigate it."

It would be hard to find a more whimsical history of science and technology than *The Pinball Effect* by James Burke, host of the popular *Connections* television programs. Through his show, Burke has been doing for technology what Joseph Campell once did for myth, making it a new branch of popular culture. In Burke's view, the factors that lead to discoveries and inventions are so interconnected, unpredictable and often accidental that their history is more like the path of a pinball caroming about its table than a linear chain of events.

And he invites us to read this history with a "Look at that!" attitude, jumping from page to page, chapter to chapter, as our interest is caught, following marginal notes that indicate where to pick up the many different threads with which each story is woven. There are, Burke notes, at least 447 different ways to read this book. (Internet users, accustomed to jumping among Web pages through "hyperlinks," will be at home between the covers of this book.)

But Burke can be read straight through without missing the vagaries of history, for he seems to abhor a linear thought the way nature abhors a vacuum. We follow Burke as he traces the evolution of sign language from early Christian monasteries in the tenth century through the founding of a French school for the deaf in the 1750s. The saga continues with a visit in 1815 by the American Thomas Gallaudet. He returned home, married a deaf woman and had a son who directed the school for the deaf that eventually became Gallaudet College in Washington, D.C.—endowed with a house and two acres by a Washington lawyer, Amos Kendall. Kendall later became business manager for Samuel Morse, whose wife was deaf and who had thought of the Morse code by tapping messages on her hand.

This innovation, in turn, made the telegraph possible, during which time a controversy raged over whether it was better to teach the deaf with sign language or voice training. One advocate of voice training was an immigrant Scottish elocution teacher named Bell, whose wife was also deaf. Their son, Alexander Graham Bell, later used a mechanical device for turning speech sounds into graphic squiggles, designed to help deaf speakers "see" their sounds. That was, in fact, how he came up with the idea for his invention of the telephone. Burke makes the art of reading a form of broken field running, an exercise that seems to require quick reflexes and eyes that see in all directions.

Burke's path is as likely to lead backward as forward in time, across continents and cultures, in and out of social history as well as science and technology. And always, we find, there are some unexpected and surprising twists and turns along the way. We owe the discovery of vitamins, for example, to the food shortages in England at the outbreak of World War I, when wheat supplies from America were cut off by German submarines.

The scientist in charge of investigating the basic necessary diet under rationing was Frederick Gowland Hopkins. Up to that moment, Burke explains, Hopkins' career as a chemist "had been highlighted by his work on wing pigmentation in the Brimstone butterfly." Furthermore, we learn, "since a key element in this [pigmenta-

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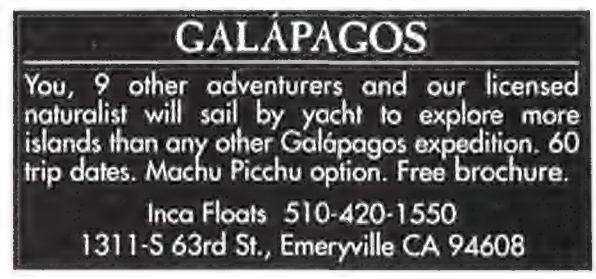
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tion] process was the action of uric acid, Hopkins had become an expert in urine chemistry, from which he had developed an interest in the relationship between the constituents of urine and those of diet." It was Hopkins' research on diet and rat urine that led, however circuitous the route might seem, to the discovery of vitamins.

One might not expect to see a connection between butterfly pigments and vitamins, but it is Burke's genius to point out such hidden links. One of my favorites is the surprising link that developed between soap making and the Impressionist painters. A young French chemist, M. E. Chevreul, who discovered how soap works, also discovered that dyes adhere to cloth in much the same way that soap coats particles of dirt. As director of dyeing at a Paris tapestry factory, he also discovered that the strength of pigmentation in dyes was less critical than the juxtaposition of colors in creating a brilliant effect on the eye. He developed a color wheel for dyers that influenced the early Impressionists: "Painters like Seurat, Signac and Pissarro used Chevreul's new law of contrast in their work. They placed spots of different colors next to each other, to create the impression of a third color."

Like soap and Impressionism, the connections Burke makes seem as unexpected now as they were unforeseen at the time. No one could have known that the invention of gaslight would reduce the destruction of American forests by loggers, who were overcutting woodland to provide railroad ties for the rapidly expanding railroads. (The by-products of coal-gas production included a tar that could be distilled into creosote, which made railroad ties last longer and reduced the demand for timber.)

Facts like these are compressed into Burke's pages like bubbles trapped in soda water, and like the bubbles, most of the facts are soon forgotten; it's the fizz we remember. Burke makes the history of science and technology stimulating in a way that produces appreciation, not just information; the leaps from radar to plastic wrap, or from the Wright brothers to ballpoint pens, are metaphors for understanding the way our own world works. Burke's gift to readers is an awareness that things around us are often less logical, and always more interconnected, than they might appear.

Burke argues that the new technologies of the Information Age are in fact rendering old ways of thinking, learning and using knowledge obsolete. What is becoming crucial is "the ability to pinball around through knowledge and make imaginative patterns." This ability, he suggests, may even serve to offer a new definition of intelligence, as we find ourselves adapting to accelerating rates of change on the ever-evolving information superhighway.

There is much truth in Burke's view of both history and the future, but his vision suffers from one glaring blind spot. The world he sees is a garden full of flowering technologies, where scientists sit like songbirds on the tree of knowledge, and all their sweet songs succeed in making life more pleasant. We get plastics without pollution, air-conditioning without an ozone hole, new drugs without side effects or resistant microbes. In a book so brilliantly focused on the interconnection of things, one would expect the author to notice that the fruits of knowledge sometimes are contaminated with pesticides. Burke's enthusiasm is what makes his writing so entertaining, but it is also the source of his limitation. "Thanks to the marvels of modern science," he writes, "the instant meal (with all its artificial flavoring and added nutritional value) is even better than the real thing." Is there a vegetable gardener reading this who could invite Mr. Burke down from the tree of knowledge and offer him a freshly picked salad for lunch?

*Paul Trachtman writes about science and other topics from his home in New Mexico.*

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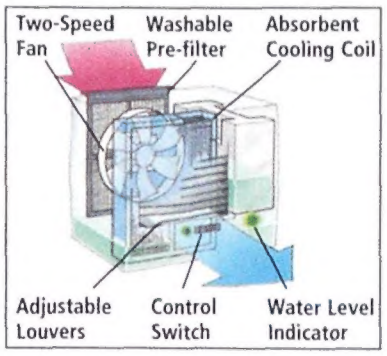


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THE LAST PAGE

# An Ant's Life is No Picnic

BY TED GUP

MY WIFE TOLD ME IT WAS A BAD idea. I should have listened. The subject was ant farms. Matthew, my 6-year-old, desperately wanted one. Truth be told, I did, too. I remembered the one I'd had as a boy. Inside was a miniature plastic farm with a tiny windmill, silo and barn sitting atop a warren of tunnels teeming with activity. There were lessons to be learned from ants. They were models of industriousness and teamwork. An ant farm, I argued, would be a colony of virtues. And so I surprised Matthew one afternoon by bringing home an ant farm.

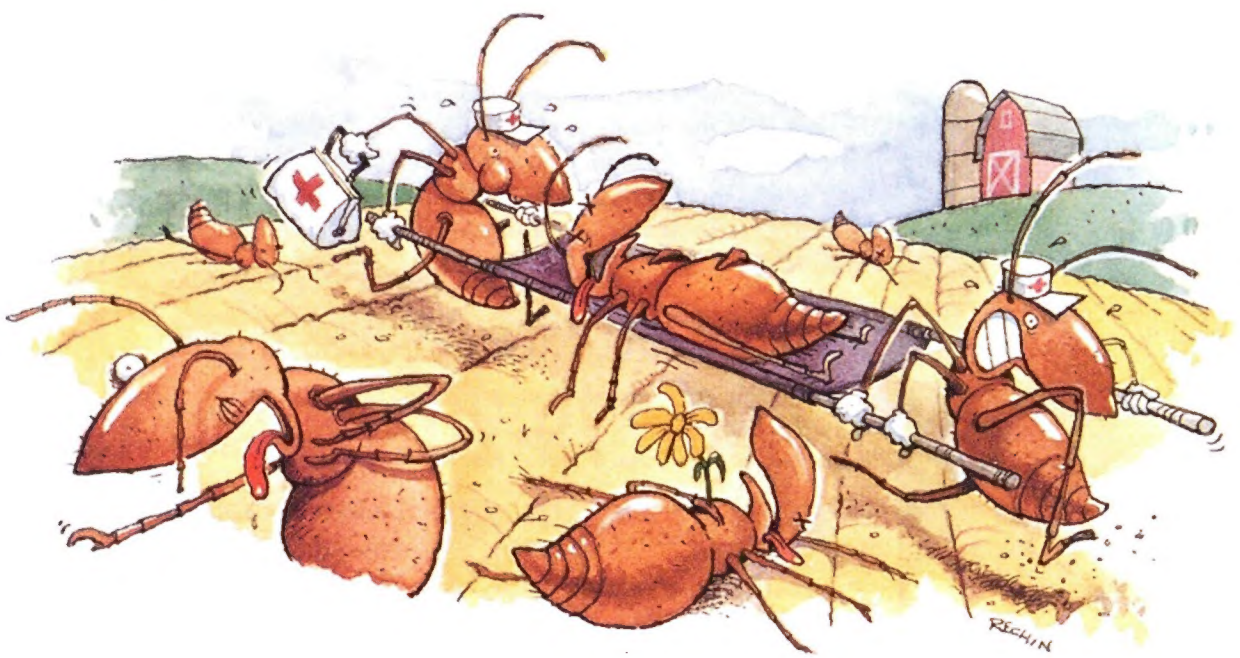
This farm came with what it cheerfully called an "Ant Certificate" which, for the modest price of $1.50, could be redeemed for real live ants. All I had to do was send away to some place out West. A few weeks later, a small yellow envelope arrived. In bold blue letters, it warned, "Keep from extreme heat & cold! This package contains Western Harvester Ants."

Inside was a narrow plastic vial with a message taped to the side: "CAUTION: ANTS CAN STING!" Then there was this: "CAUTION: DO NOT TOUCH ANTS. Their sting may cause swelling and itching, especially for those allergic to stings. Adult supervision recommended." These ants, the instructions said, were the best to observe because "they are aggressive."

Matthew watched as I gently tapped the vial, sliding the ants into their new abode. One particularly feisty ant climbed out of the top and tried to make a break for it. I stopped him with the soft pulpy ball of my index finger. I felt a shooting pain as a stinger at the end of the ant's gaster pierced my skin, injecting me with formic acid. After barely smothering a curse, I smiled at Matthew and only later, out of view, dressed my wound. These truly were ants from hell.

For several days, the new ants prospered, excavating tunnels and carting off our offerings of fruit and chocolate Girl Scout cookies. Then, one by one, they began to sicken and die. We offered the survivors more water, pears instead of apples, a few hours of indirect sunlight. And still they died.

*Then, one by one, the farm ants began to sicken and die*




I consulted the instructions. "You will be amazed at what these little engineers can do!" But Matthew and I were less than amazed. We sadly eyed the pile of dead bugs and one lone survivor.

About this time, something odd happened. We began to have ants in the kitchen. First just one or two strays, then more. These were not escapees from the farm, but the indigenous species—our own *Marylandis kitchenesis*. They flourished. Across the countertops they formed an endless processional, carrying off crumbs and congregating at spills, especially droplets of soda and maple syrup. Their numbers exploded. We put out ant traps, tiny toxic motels set along their trails. They ignored them. We bombed them with a pesticide and still they came.

Matthew was captivated. We were now living in an ant farm. He utterly forgot about the last remaining harvester ant. Alone, I attempted to nurse the survivor, who staggered across what had become a plastic Boot Hill. Meanwhile, my wife and I were daily grinding the wild ants under heel, or snuffing them out with paper towels, or subjecting them to ever more toxic agents. Rescue and exterminate, rescue and exterminate. It was sheer madness.

On Tuesday, the ant farm went out with the trash. The wild ants continue to plague us, a reminder that nature is rarely compliant and neither to be contained nor managed. Matthew, take note. The lesson may have been unintended, but it is no less valuable.

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